" The relative position of jute therefore is far below any of the first three crops so far as acreage is concerned. But when we examine the outturn we find it is little inferior to cotton, not far off wheat, but very far away from rice as indeed all other crops are. But if we now examine the value of outturn per acre we find the order to be as follows :—

	Rs.
Jute	145 per acre
Rice	52 ,,
Wheat	36 ,,
Cotton	32 ,,

" Now, if we just glance at districts where over 10 per cent. of these crops are grown we find that the wheat tracts in the Punjab maintain a population of from 63 to 560 to the square mile, cotton in Bombay from 151 to 396, cotton in the Central Provinces from 93 to 193, while the jute districts in Bengal maintain a population of from 580 to 1,066 to the square mile. Now, gentlemen, what do all these figures show ? They unmistakably indicate that the jute crop is one of first class importance, that it gives the highest return per acre of any crop grown in this country on a large scale, not excepting sugar whose average yield is worth only Rs. 127 per acre over an area of 2½ million acres. The whole of the sum of Rs. 145 per acre does not go into the pocket of the cultivator for there is the middleman and I rather suspect that jute has to pay more to the middleman than any crop in India. Still it must give a very high rate of profit to the cultivator and be the source of considerable prosperity to a dense population. Of course the people in the jute districts do not entirely depend on the jute crop, but mostly on the rice crop, but the large profits from jute must make the degree of prosperity very much higher than it would be otherwise. Therefore, gentlemen, I have said enough, I think, to convince you that so far as the cultivator is concerned, the jute crop is a very important one and deserves all the attention you can give it. The figures which I have given you of the value of the jute crop, 60 crores or £40,000,000, represent its value to this country, as practically the whole of this large sum remains in the country. It does not include profits made by the mills some of which are exported, but most of which, I believe, also remain in the country.

" I have been fortunate, gentlemen, in securing the presence at this meeting of Mr. D. Clouston, the Deputy Director of Agriculture in the Central Provinces. I have done this because the Indian Jute Mills' Association have, as I have already explained, laid stress on our adopting the measures similar to those carried out in the improvement of the cotton crop in Berar. I would not for a moment lead you, gentlemen, to think that the actual methods employed for the improvement of such a crop as cotton in such a soil and climate and under the Land Tenure System of the Central Provinces are in every respect applicable to jute cultivation in your provinces, but, I believe, the principles under which the work is carried out will, in all probability, be the same and be so applicable. Anyhow, Mr. Clouston is here to explain to you how this work is done and I feel confident that he will from his experience be of great assistance to you in judging of your present methods of improvement and in helping you to place them on a better basis if there is any need to do so.

" On this question of the principles which should guide us in the improvement of the crop it may be desirable I should say a few words. On the most suitable methods for the production and maintenance of the supply of pure seed of improved varieties of crop and the best organisation for carrying this out, we have the report of the committee on this subject which was adopted by the Board of Agriculture of 1911 to which I invite your attention.

" It is there laid down that the general aim to be kept in view in the improvement of crops in India is the replacement wherever possible, of the existing mixtures by pure types characterised by increased yield and by improved quality. It gives the methods which should be adopted for obtaining improved varieties, for the testing of those varieties, for the maintenance of pure types for distribution to cultivators and for the marketing of the produce.

" Then on the question of organisation I would particularly draw your attention to the Resolutions III and IV of the Board of Agriculture of 1913, which are as follows :—

" *Resolution III.*—That the Board place on record their opinion that if the most effective work is to be done, all subordinate agricultural officers, whatever their rank, should be directly under the Director of Agriculture and his superior staff ; and that while a very close co-operation with the executive head of the district is desirable the actual control should be with the Agricultural Department."

" *Resolution IV.*—The Board considered that, in any province, the policy of opening farms before there is an adequate superior staff to manage them and that of extending demonstrations before there is a *trained* staff to carry them out, is fundamentally unsound."

" We have also the Reports on the Introduction of Improvements in Indian Agriculture especially the later ones from which much useful information can be gleaned. I would also invite attention to the systems used by agricultural officers in the Central Provinces, Madras and the United Provinces and of Mr. Howard at Pusa in the improvement of such crops as cotton and wheat. I would also invite your perusal of Mr. Evan's article in the July 1913 number of the Agricultural Journal of India on the Organisation of Seed-farms. I feel sure you will find these references of great use to you even though they may not in all particulars be directly applicable to jute. The time allotted for the Conference is 3 days which I trust will be sufficient. If more time is required, an extension can be arranged for. On the last day it is proposed to invite the attendance of members of the Jute Trade. It will be an advantage to you, gentlemen, not only to hear what the representatives of the trade have to say on the question of the cultivation of the crop but you will be able to discuss and explain to them the resolutions of this meeting. This arrangement will, I feel sure, be to mutual advantage and lead, I hope, to a close understanding of the requirements of the trade, a matter which you will, I feel sure, agree is of very great importance.

" We will now, gentlemen, proceed to consider the terms of reference."

4. The President asked if there were any suggestions for modifications in the terms of reference. No suggestions were forthcoming.

5. The Conference then proceeded to consider the *first term of reference*, viz., " *To specify the defects (if any) existing in the cultivation and production of the crop and to define the problems which come within the scope of the Agricultural Department.*"

The President having asked Mr. Blackwood if he had any remarks to make on this subject, the latter suggested that Mr. Finlow should read his note. This was agreed to and Mr. Finlow read his paper to the meeting. (*Vide* Appendix A).

Discussion on Mr. Finlow's Note.

(*a*) *Retting.*—The President remarked that the note reminded him that the consideration of retting had been omitted from the agenda.

Mr. Finlow, in the course of remarks on this point, said that he thought decortication might come greatly into use in the next few years.

(*b*) *Drainage.*—Mr. Finlow's remarks on drainage aroused some interest. In view of Mr. Finlow's insistence on the importance of drainage, the President enquired how it was that such heavy jute crops were obtained in the flooded Brahmaputra Valley. Mr. Finlow explained that his remarks referred to the early stages of growth of the crop. He mentioned that ryots in South-East Mymensingh appreciated this fact and drained their young jute but he thought that the fact was not generally appreciated in other parts.

(*c*) *Manuring.*—With reference to Mr. Finlow's remarks on manuring, the President drew attention to the fact that rock phosphate was available in India.

As a result of discussion the Conference agreed unanimously on the following resolution :—

Resolution 1. **" The Conference is unanimously of opinion that there appears to exist room for improvement in the existing system of cultivation and production of the jute crop, more especially by better care of the crop in the matter of weeding, thinning and of drainage in the earlier stages of its growth ; by the use of more efficient implements, such as the drill, the spring-toothed cultivator and European hoes, the conservation**

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on 31 October, 2019

and use of cowdung and the use of artificial manures and of green-manuring. It also considers it desirable to keep in view any possible improvement of the present system of retting and the question of devising new processes for the extraction of the fibre."

6. The meeting then considered the *2nd item of reference*, viz., "*To enquire into the lines of work and methods in use by the Agricultural Department for the improvement of the crop and to say whether they are suitable and advise generally on the policy which the Agricultural Department should adopt in dealing with this crop. In particular, to advise —*

(*a*) *on the methods affecting improvements in cultivation, the introduction of improved varieties and the supply and distribution of seed;*

(*b*) *on the organisation required;*

(*c*) *on the adoption of any special measures such as the extension of area under jute or its substitutes.*"

Bengal.—The President called on Mr. Blackwood to give a description of the lines of work so far being pursued by the Bengal Agricultural Department.

Mr. Blackwood remarked that he did not consider that it had been definitely established that Mr. Finlow's seed was the best obtainable in the Province. He stated that the Department is comparing Mr. Finlow's selected seed with seed selected in the field by demonstrators under the instructions of Mr. Blackwood and with the seed as saved by the ryots themselves. The nucleus or organisation for distribution in the form of a seed store in every division was already available for the time when the best available seed was decided on. The question is whether or no there should be a seed store in every district. Mr. Blackwood further remarked that immediate work lay in the direction of manuring and production of better seed. He considered cowdung the best manure and said that the Department had also established the value of bonemeal and lime on red soils.

The President asked if Bengal had an established system for seed distribution. Mr. Finlow replied that there was no such system because there was not sufficient demand for the seed, but that the policy laid down was as follows :—

Seed is being produced on private estates, *e.g.*, estates in Bihar and on Government farms. It is proposed to establish seed farms when a suitable stage is reached.

The President asked if seed so far given out to cultivators had first been compared with country seed on Government farms. Mr. Finlow replied that it had not and agreed with the President's suggestion that the distribution of his selected seed was not really a demonstration but still an experiment.

The Conference recognised that a special difficulty in work with jute was the fact that it is not altogether practicable to grow the crop for seed as well as for fibre, as could be done in the case of cotton.

Mr. Finlow remarked that tests would be made in the Bhairub district and there was reason to believe it would be adopted.

Bihar.—The President asked Mr. Milne as to what was being done in Bihar. Mr. Milne remarked that very little was being done with jute but Mr. Finlow's seed was being tested against local Purnea seed.

Assam.—Mr. Edwards remarked that they were doing nothing this year except trying some of Mr. Finlow's seed, as compared with local seed. There is a seed depôt at Gauhati from which seed is supplied on demand, but the demand this year has been practically *nil*. At the same time the Birkmyre Jute Estate was situated at Kamrup in their province. This Estate consists of 85 square miles and nearly 100 acres are under jute at present.

Mr. Meggitt remarked that the farm is having a good effect. Manurial plots have been laid out by Messrs. Birt and Finlow. The Estate has a seed-drill and a reaper in addition to a very complete set of steam cultivating machinery. They are testing Mr. Finlow's seed against local races. The bark is being stripped from the jute by machinery and the bundles of ribbons are being retted, but they have not yet decided whether to go in for ordinary or chemical retting.

The Conference considered the work being done was very valuable.

7. The President then asked Mr. Clouston to give an account of the way in which he had organised his successful system of cotton seed distribution in the

Central Provinces. His remarks are printed in full as Appendix B. The following is a summary of the remarks :—

" The improvement of cotton had been taken up by the Government of the Central Provinces from time to time. No results of material value were obtained till within the last ten years. The earlier efforts aimed at extending the cultivation of long-stapled cottons quite irrespective of their yields. *Bani*, a variety giving a small outturn of lint of very fine quality, was the cotton recommended to the cultivators for cultivation, and steps were taken to buy and distribute large quantities of *Bani* seed. These efforts ended in failure for the following reasons. *Bani* gave a poor yield of *kapas* (unginned cotton) and its *kapas* gave a low yield of lint to seed. The *Jari* cotton of the Provinces gave much larger yields of *kapas*, and the percentage of lint to seed was about 34 per cent. as opposed to 26 per cent. for *Bani*. The cultivators had other objections to *Bani*. The bolls were small and loose, and the cotton was therefore hard to pick. The variety was a delicate one too, and suffered more than *Jari* from water-logging and drought. The attempts to help the cotton industry by introducing exotic variety proved equally unsuccessful. The American cottons tried did badly. One variety better than the others did find a footing in the Provinces but we have conclusively proved that it is an unprofitable cotton for the cultivator to grow.

" About ten years ago, the improvement of cotton cultivation in the Provinces was taken up on new lines. The cottons were classified and each variety was grown as a pure crop. The classification showed that *Jari* cotton was a mixture of several distinct varieties which varied enormously in yield and quality of lint. Varietal experiments, too, were carried out, which proved that *roseum*, one of the varieties in the mixture, was by far the most profitable for the climatic and soil conditions which obtain in the cotton tracts of the Central Provinces and Berar. The money vlaue of this variety per acre was over Rs. 6 more than that of *Jari* which occupied 99 per cent. of the cotton area at that time : while compared with *Bani* the yield of *roseum* was worth Rs. 22 more per acre.

" The selection and propagation of this desirable variety of cotton, *viz.*, *roseum*, was taken up on the Akola Government Farm in the cotton tract. The seed was distributed to private cotton seed farms run by land-holders who propagated the selected strain and distributed the seed to cultivators. From these seed farms Co-operative Agricultural Seed Unions have since been evolved which have enormously facilitated the work of seed distribution by the Department —enabling it to produce and distribute about 2 million pounds of seed last year. It was hoped that these unions would become the centres for agricultural development in the districts. They are already being used as depôts where improved implements are stocked for sale, and as centres for the dissemination of information regarding agricultural improvements generally."

Discussion.

Mr. Clouston suggested that ryots growing Mr. Finlow's seed should be told to always keep a portion of the crop for seed.

The President remarked that Mr. Clouston's suggestions that we should start seed farms in Bengal appeared to be a good one.

In reply to a question put by Mr. Clouston, Mr. Finlow said that in the Dacca Farm his jute seed gave the biggest crops and he was thoroughly convinced that it was the best seed for the Dacca Farm that he had so far obtained. Next, however, it had to be tested in other parts of Bengal.

8. The President then suggested that a small committee consisting of Messrs. Birley (Chairman), Clouston, Dobbs, Finlow, Smith, Hector and McLean be appointed to submit a report describing the best methods of testing and distributing the departmental seed which would be submitted to the meeting the next day.

Manuring.

9. *Cattle-dung.*—Attention having been drawn to the importance of cattle-dung as a manure, the President asked whether it were practicable to introduce fuel, *e.g.*, coke in place of cowdung for fuel. This was considered impracticable at present as a new kind of stove would be required.

Lime and bonemeal.—These have been shown to be very valuable on certain soils.

Conserved Weeds.—Mr. Clouston mentioned that weeds might be collected and used as manure.

Oil-Cakes.—The President asked if oil-cakes could not be used. Mr. Smith said they gave good results, but Mr. Finlow remarked that the demand was so great in the tea districts that their price was increasing.

Tank Silt.—Mr. Smith recommended the use of tank silt.

Rotations.—Mr. Meggitt suggested that more attention should be paid to rotation of crops. He suggested a three-year rotation and remarked on the importance of this including a green-manuring crop, at least a catch crop.

In the rotation he recommended that bonemeal be applied to paddy. He further called attention to the good effect of ashes. He also thought that the residual stalks from retting might be returned to the soil, but Mr. Smith pointed out that they are used at present as fuel and therefore they save some cowdung.

The Conference unanimously agreed on the following resolutions :—

Manuring.—**"It is considered that the attention being given to manuring is sufficient and should be continued especially in the following directions :—** RESOLUTION II.

(*a*) Conservation of cowdung ;

(*b*) application of—

(1) Cake manures,

(2) lime,

(3) bonemeal ;

(*c*) Green-manuring;

(*d*) Use of weeds and refuse jute stalks ;

(*e*) Artificial manures.

"The Conference approve the idea of experiments in the rotation of jute with other crops, also that the manuring experiments should be carried out in conjunction with a suitable rotation. The rotation and manuring would probably vary according to the condition in different tracts."

Extraction of Fibre.—**"The Conference note that an investigation has been made into the retting and extraction of jute and approve of continued attention being given to this subject."** RESOLUTION III.

Implements.—**"The Conference considers that possibly good results may be obtained by the introduction of certain improved methods of cultivation such as the use of the spring-tined harrow and the use of drills. In conjunction with drilling the introduction of hoes for interculture might be an advantage. Work already done at Dacca has shown that good results are to be expected on these lines."** RESOLUTION IV.

ADOPTION OF SPECIAL MEASURES FOR EXTENSION OF AREA UNDER JUTE OR ITS SUBSTITUTES.

10. This subject constitutes 2 (*c*) of the terms of reference.

The President asked for the views of the Conference on this question.

Mr. Blackwood said that it had been laid down by the Government of Bengal that every effort should be made to increase the yield of jute per acre, but that no attempts should be made directly to increase the area as this could safely be left to the cultivators themselves.

Mr. Milne remarked that he had reason to believe that his Government held similar views.

Mr. Edwards agreed and remarked that the area under jute in Assam had trebled itself within the last ten years.

Mr. McLean suggested that it is desirable to introduce a system of co-operative sale, in order to do away with the middle-men and to give more profit to the cultivator.

The meeting agreed with the views of the above three Governments as expressed by their Directors of Agriculture in so far as anything in the nature of the forced extension of jute cultivation could not be entertained.

For remarks on jute substitutes reference should be made to Mr. Finlow's paper (Appendix A).

The following resolution was unanimously adopted:—

RESOLUTION V. ***Extension of area under Jute and its substitutes.***— **"On the question of extension of area the Conference is of opinion that any large increase must ultimately depend upon a rise in price and profits likely to accrue to the cultivator in comparison with those realised from the cultivation of other crops, or on greater profits caused by either manuring or better seed supply or improved cultivation. It also considers that owing to the increasing demand for, and rising prices and large profits to be obtained from the cultivation of fibres, the desirability of experiments to carry out this policy in all tracts where jute or its substitutes are already of considerable importance, should be kept in view, as well as the possibility of growing them in tracts where they are not at present cultivated."**

SECOND DAY.

ARRANGEMENTS FOR TESTING OF SEED AGAINST COUNTRY SEED.

11. The Hon'ble Mr. Birley read the following report of the Special Committee appointed on the first day to consider this matter:—

"The first object to be achieved is to test sufficiently in different soils of different areas in Bengal the seed which has been found by experiment on the Government farms to promise the best results.

"To do this it is necessary that the officers who are conducting the tests shall have complete control over the land on which the tests are carried out and of the cultivation of that land.

"Under present conditions they have not such control, neither have they sufficient number of capable officers for exercising supervision under their orders.

"It is recognised that it would not be practicable to acquire outright a sufficient number of plots and to provide quarters for a special staff for conducting the cultivation and supervision.

"A possible alternative is to arrange that the trained demonstrators should devote plots of their land to this purpose and should cultivate them. This would ensure that the cultivation was conducted according to order, provided that the demonstrator was really a cultivator and provided that there are available trained officers of the Agricultural Department for supervision.

"It is expected that 30 such plots would be sufficient for these tests."

12. The President asked Mr. Blackwood his opinion of the report.

Mr. Blackwood said that provided the plots could be obtained for the work, he thought the scheme was sound, but he thought there would be some difficulty in obtaining the kind of plots desired.

The Hon'ble Mr. Birley replied that there were so many demonstrators at present that it was considered that some at least of these men would be found suitable.

Mr. Birley further explained that immediate attention should be paid to using the plots for testing Mr. Finlow's seed.

The President asked if the plots were intended to be also used as seed farms or if this work is considered premature. Mr. Finlow agreed that this work would be premature.

Mr. Blackwood asked in how many districts it is proposed to have plots on the system laid down in the report.

Mr. Finlow suggested Mymensingh, Bhairub, Munshiganj, Faridpur, Gaibandha and Lalmanirhat.

Seed Testing.—The Conference then resolved that, "the report of the Committee be adopted with the following modification proposed by Mr. Blackwood :— RESOLUTION VI.

" It is not essential that the plots selected shall be the property of the demonstrators provided that they can be placed under the control of the Department and can be cultivated by the demonstrator."

13. *Supply and distribution of seed.*—The President asked if it were considered premature to consider this question.

Mr. Finlow agreed that it was, and that when the time came we could proceed on the lines of Mr. Clouston in the Central Provinces.

Mr. Milne thought that once he had seed, he would have no difficulty in its distribution.

The following resolution was unanimously adopted by the Conference :—

Supply and Distribution of Seed.—" The Conference having heard Mr. Clouston's account of the methods and organisation for the distribution of seed in the Central Provinces, decided that it is not at present necessary to lay down any definite lines for this work in the jute-growing provinces. When the demand for seed becomes sufficiently great the Department concerned should bear in mind Mr. Clouston's methods in working out a suitable system of distribution. In the meantime the distribution of seed, as at present carried out, should be continued and pushed forward with as much energy as possible." RESOLUTION VII.

14. The Conference next considered *terms of Reference 2 (b) Organisation.*

The President asked Mr. Blackwood to explain to the Conference the organisation of the Agricultural Demonstration staff in Bengal.

Mr. Blackwood said the staff consisted of 2 Deputy Directors of Agriculture, 5 Superintendents one for each Division, 10 District Agricultural Officers, and 80 Demonstrators. He added that the experts considered that more Deputy Directors of Agriculture are required and also considered that 17 District Agricultural Officers are required as a minimum and also 169 Demonstrators.

Mr. Blackwood next described the items being demonstrated with jute :—

(1) *Mass selection by ryots.*—In selected plots a demonstrator under supervision of the District Agricultural Officer marks down the best plants for seed. Next year the seed from these is sown side by side with cultivators' seed for comparison. This year Mr. Finlow's seed has been tested also with these seeds.

(2) *Manurial Demonstrations.*—(*a*) Conservation of cowdung, (*b*) the use of lime and bonemeal on red soils.

(3) *Implements.*—The Meston plough on certain soils gives good results and is being demonstrated on those soils.

(4) On the farms, Mr. Finlow's seed is being multiplied.

The President asked Mr. Finlow if this organisation satisfied him.

Mr. Finlow replied that it did not, and that it was not entirely a question of inefficiency of the staff; a certain lack of experience and a certain want of organisation owing to scarcity of Deputy Directors of Agriculture was apparent.

Mr. Finlow read extracts from a combined note by the Dacca Experts on a scheme of Mr. Blackwood for re-organisation of the Agricultural Department.

Mr. Finlow pointed out that the large area under the control of each demonstrator made it impossible for these men to be of any use to the Department during the time of the jute forecast work.

The opinion of the meeting was that even if all the demonstrators were taken off jute forecast work, the staff would be insufficient.

The President pointed out that the demonstrators were under two masters and such an arrangement can never be satisfactory. Mr. Blackwood said he would be pleased if the Deputy Directors of Agriculture took charge of the forecast so that they could get complete control of the demonstrators. The Deputy Directors of Agriculture both expressed their willingness to undertake the forecast work if they had adequate staff and more Deputy Directors of Agriculture.

Mr. Milne suggested that the first procedure should be to settle the number of the staff which Mr. Finlow requires for his demonstration work.

Mr. Milne said that the jute forecast does not give anything like the same trouble in Bihar as in Bengal. Bihar has only one-tenth of the acreage and the present staff was capable of doing the work. The ideal arrangement would be to have a special statistical staff to deal with jute and other crops.

The following resolution was carried unanimously :—

RESOLUTION VIII. **"The Conference is of opinion that the work in connection with the jute forecast seriously interferes with the demonstration work of the Agricultural Department because the most arduous portion of the forecast work comes just at the time when agricultural experiments require most supervision. It is considered that the forecast is of great importance and cannot be neglected and for this reason the creation of a separate statistical staff is necessary. Such a staff would be able to undertake statistical work in connection with other crops and would, at the same time, relieve the agricultural staff of duties which are at present seriously crippling its efficiency."**

The Conference unanimously adopted the following resolution :—

RESOLUTION IX. **Appointment of more Deputy Directors.—"The Conference is of opinion that the success of the work of the Departments of Agriculture in the jute-growing provinces is at present handicapped for want of sufficient trained experts especially Deputy Directors. Till a strong and efficient expert staff is appointed by each province, both the scientific and demonstration work in hand must necessarily suffer.**

"In the absence of an adequate staff of Deputy Directors to devise and supervise experimental work of the experiment stations and to organise demonstration work based on the practical results obtained on these stations a large staff of demonstrators should not be appointed.

"The Conference holds that in the building up of an Agricultural Department a commencement should be made by first getting the necessary superior expert staff and that demonstration work should be organised and the demonstrators trained by the expert staff. To meet the present demand of the Department at least three more Deputy Directors are required for Bengal."

THIRD DAY.

15. The proceedings of the second day were confirmed. Mr. W. Ross-Smith, Chairman, Indian Jute Mills' Association and Mr. Suttie, representing the Jute Forecast Committee attended the meeting.

16. The President having read the proceedings of the first two days and having explained the objects of the Conference called upon Mr. Ross-Smith to say how far the resolutions met with his views.

Mr. Ross-Smith remarked that he thought the resolutions expressed exactly what the Jute Mills, Association had been pressing for for years. Mr. Ross-Smith went on to say that some time ago when the matter of creating a separate staff for the jute forecast came up they offered to subscribe towards it. They were, however, astounded when a scheme costing 4,50,000 per annum as prepared by Government was put before them and they were asked to put up the full amount; so they withdrew their offer. Mr. Beatson Bell asked if we had a sum of money to spend whether Mr. Ross-Smith would rather we spent it improving the agriculture of the crop or the forecast.

Mr. Ross-Smith was of opinion that money should rather be spent on improving the crop than the forecast. He could not understand why such an enormous staff should be required for forecast work as the trade make their own forecast with a simple staff and get figures approximating closely to the actual outturn. It was the very large sum which they found a special Government staff would entail and the proposed payment of 3 lakhs per annum to *Panchaits* which made them withdraw their promise to pay a proportion of it.

Mr. Suttie said we wanted maps for Bengal. The Hon'ble Mr. Beatson Bell pointed out that accurate maps were in existence for most of the jute-growing areas.

Mr. Ross-Smith remarked that the money spent on the Bengal Agricultural Department was very small; but Mr. Beatson Bell pointed out that the Department had recently been increased.

Mr. Suttie in reference to Resolution No. V on the increase of area of jute thought there were considerable tracts in Bengal where jute might be grown if better arrangements were made for transport of the product. He said where there was plenty of water-transport there was plenty of jute. He suggested that if a railway were made from Rampur Boalia to Nattore, jute would be grown there. Also he thought there was a lot of suitable land on the Sara-Sirajganj line.

The President endorsed Mr. Suttie's remarks as to the usefulness of improving communications for a bulky crop like jute and instanced the case of the Central Provinces where the increase of areas under cotton synchronised with the making of roads and the opening out of communications. He also mentioned the case of Beawar in Ajmere where ten years ago there were no railways and no cotton; whereas, now there are railways and plenty of cotton.

In support of Mr. Suttie's remarks the Conference adopted the following resolution:—

"That attention should be paid to improving the facilities for transport in tracts where these are inadequate." RESOLUTION X.

Mr. Suttie remarked that jute gets into Calcutta quickly enough. There is no need for increasing facilities in this direction. He also suggested that some of the field demonstrations with jute should be carried out on land owned by mofussil agencies of jute firms and mentioned an experiment with Mr. Finlow's seed at Narainganj in collaboration with Mr. Luke. He said this was the finest jute crop he had seen this year.

17. Mr. Finlow then read an extract from his last year's Annual Report in which he had made the same suggestion. Mr. Finlow also thought that later on these jute agencies might act as distributing centres for his seed. Mr. Suttie said that he thought jute firms would give land where they had it and the necessary supervision.

18. It was decided that representatives of the Agricultural Departments should confer with the Loose Jute Dealers' Association in order to arrange suitable places for trials. The following resolution was then passed by the Conference:—

"This Conference gratefully accepts the offer of jute firms to assist by giving land and facilities to agricultural officers for their experimental work and strongly supports the proposal." RESOLUTION XI.

19. Mr. Suttie said the trade liked *Olitorious* better than *Capsularis*. They gave a better price for it as it was a better fibre. He also said Mymensingh jute is considered of better quality than North Bengal jute generally and if the seed gave the same quality in other parts it would be worth while taking the seed to other districts.

20. In reply to a question by Mr. Finlow, Mr. Suttie remarked that colour of fibre was important but not as important as it used to be. He further remarked that colour and gloss of fibre were co-related with strength of fibre. He also thought that if jute was dried in clear bright sunshine one obtained a better colour than if it had to be dried under cover in bad weather.

21. Mr. Finlow asked what was thought of *mesta* fibre (*Hibiscus cannabinus*).

Mr. Suttie replied that it was used by the trade but was brittle.

Mr. Ross-Smith and Mr. Suttie agreed that the growth of this crop should be encouraged in other parts of India but not in Bengal.

22. The President called attention to the fact that Pusa can supply seed of a good race of this plant if there is a demand for it.

Mr. Suttie considered that the growth of *Olitorious* should be encouraged in parts of East Bengal where the land is suitable, as it must be grown on high land.

23. Mr. Beatson Bell said that he hoped that the Jute Mills' representatives would disabuse themselves of the idea that the Government of Bengal were opposed to any increase in the Agricultural Department. They had recently appointed another Deputy Director but the war held up further expenditure at present.

24. Mr. Ross-Smith presented papers to the Conference which represented the views of the trade and which are printed as Appendix C.

25. The President wished to thank the Jute Trade representatives for attending the meeting and for the valuable assistance they had given. He also thanked Mr. Annett for recording the proceedings of the Conference and Mr. Clouston for the assistance he had given.

26. Mr. Blackwood proposed a vote of thanks to the President and this was carried unanimously.

27. The Conference was then closed.

APPENDIX A.

Note on Jute.

By Mr. R. S. Finlow, B.Sc., F.C.S.

(*Fibre Expert to the Government of Bengal.*)

In offering my remarks I propose to take the terms of reference as defined by Mr. Coventry and deal with them *seriatim* from the practical point of view and as far as possible in the light of actual experience.

(1) To specify defects in the cultivation and production of jute, etc. :—

In the case of jute, as with every other crop, the possibilities of defects exist in every stage of its production including :—

(*a*) the seed,

(*b*) cultivation and manuring of the land,

(*c*) Cost of weeding and thinning and of cutting, steeping and stripping.

(*a*) *The seed.*—For the present it is only necessary to deal with the question of heaviness of yield of fibre. There are undoubted differences in the quality of fibre produced by different races ; but these differences are comparatively small and their importance is overshadowed, for the present, by the urgent necessity of obtaining an increased supply of the fibre at prices more nearly normal than has been the case during the last five years.

As far back as 1872 jute cultivation was to be found in 47 out of 58 districts of the old Bengal Presidency, when the aggregate area under the crop was less than one-third of what it is to-day. It would appear therefore that the cultivation of jute in ancient time was almost as widespread as it is now and that the large expansion in production is due rather to an increase in the percentage of jute cultivation in the old districts than to its introduction into new tracts. Even in 1872 the fear was expressed that the large increase of jute cultivation which had recently taken place in some districts would entrench on the cultivation of food grains, as it was fairly certain that at least $\frac{2}{3}$rds of the area then under jute was formerly devoted to food grains. The demand for an investigation into the possibility of improving the yield per acre—and incidentally, if possible, the quality also—of jute fibre thus arose quite naturally. A commission was in consequence appointed in 1872 to investigate " the cultivation of and trade in jute in Bengal " and a voluminous report was issued in due course by Hem Chandra Kerr. This may be taken as the starting point of experimental work in connection with jute.

It is interesting to note that even at the early date (1874) at which Hem Chandra Kerr's report was written, there was a conviction in the minds of some people regarding the gradual deterioration of jute fibre. The report admits that a larger proportion of inferior fibre may have been coming into the market but says this is due, not to any intrinsic deterioration in the plant, but to defective cultivation and preparation and also, to some extent, to fraudulent watering. These points were all brought up for discussion 27 years later—1901—when the Calcutta Baled Jute Association approached Government with the request that the Agricultural Department might take up an investigation with the object of improving the cultivation and yield of jute. This request was acceded to and a Sub-Committee of the Board of Scientific Advice was appointed consisting of Mr. Mollison, Inspector General of Agriculture, Lieutenant-Colonel (now Sir David) Prain, I.M.S., Director of the Botanical Survey, and Mr. I. H. Burkill, acting for Dr. (now Sir George) Watt. The latter had already commenced work on jute over a year previously. During the year 1902-03 the practice of fraudulent watering of jute appears to have increased considerably and the outcry regarding deterioration was renewed accompanied by an insistent demand from the jute trade in Calcutta for penal legislation against the watering of the fibre. Fraudulent watering had always been practised to some extent ; but about the year 1903-04 the supply of jute began to run short and it increased enormously. An investigation, the results of which were published in 1906, showed however that legislation, apart from other disadvantages, would involve legalizing the addition of 10 per cent. or even more of fraudulent water. This was due to the necessity of setting the standard of maximum moisture sufficiently high.

Government finally decided that the real cause of the evil was a discrepancy between supply and demand, the obvious remedy for which would be to increase the quantity of jute fibre produced, by extending the area devoted to jute and similar fibres, and by improving the cultivation of jute both as regards the obtaining of better seed and the use of better agricultural methods. These considerations have determined the lines on which all subsequent work has been carried out.

In 1904, the Sub-Committee of the Board of Scientific Advice issued a report in which certain conclusions are detailed regarding the characteristics of the two species *C. olitorius* and *C. capsularis* and of the races of each of these which are in common cultivation in Bengal. These conclusions are summarised in my "General report on jute for 1904-05." The Sub-Committee reported emphatically against the idea of degeneration in either species saying "the best kinds now as then (a century ago), if cultivated liberally, yield excellent crops and the fibre, if properly extracted, is also excellent." At the same time the Committee pointed out that some districts may not be cultivating the most suitable kinds and stated that "it is necessary first to discover the most suitable kinds; in some instances it may be advisable to attempt by selection or otherwise to evolve new kinds more suitable for the purpose than any known kind." These quotations describe clearly the lines on which the work on jute was commenced. In 1906, in collaboration with Mr. I. H. Burkill, Acting Reporter on Economic Products to the Government of India, I commenced an elaborate survey of the races of jute in Bengal, both by examination of crops in the field and by the study of plots sown with seed obtained from all parts of the jute-producing tracts. The results of this enquiry, a preliminary account of which was published in *Agricultural Ledger* No. 6 of 1907, showed the existence of very wide and important cultural differences between respective races of both *C. capsularis* and *C. olitorius*. It was found that some races have a considerably raller stature and therefore, other things being equal, a correspondingly greater yielding power than others. A suitable basis for pure line selection was thus found and we have been able to produce pure lines which are, on the whole, the heaviest yielders of fibre which we have yet met with amongst races of *C. capsularis*. Some of these pure lines have now been multiplied and in the last season, 5 tons of seed, sufficient to sow 1,400 acres, was produced for distribution. A considerable quantity of the seed has been sold in the present season but owing to the restricted demand consequent on the low prices obtained for the fibre, it was not possible to dispose of the whole stock, as would almost certainly have been the case under normal conditions. The multiplication of the seed is being continued and, as cultivators in several districts are already beginning to signify their preference for it, there will be a continually increasing demand.

We have seen that the jute races in question have been selected as the best amongst a very large number of types procured from every jute-growing district and we know that they are good in every particular. It is of course possible, perhaps even probable, that they are actually the best; nevertheless, in view of the large area over which jute is grown and the very numerous types to be met with in every district, it would be unwise to make such an assumption. Therefore, in pursuance of a deliberate policy of arriving ultimately at the best, test plots have been put down throughout the jute-growing districts in order to compare our selected races with the local ones on the spot. If any local races show themselves superior in any way they will be investigated next year. With the same object in view a very large number of small plots, over 700, have been grown on the Dacca Farm from seed sent in from the districts. Thus, with all the information which we shall derive both from the district plots and from the plots on the Dacca Farm, we hope to advance materially this season towards our goal. The task is no easy one as any one who has attempted experimental cultivation under such circumstances will allow. We have made mistakes in some respects already; but we hope to profit by the experience and avoid them in the future. If we ultimately succeed in finding better races the distribution of their seed will be easy as the initial difficulty of attracting the attention of the cultivator has now been largely got over. It is of course possible that one race will not do equally well in all jute-growing districts and we may find it necessary to produce a race for each tract. This will almost certainly be the case in the so-called *desi* districts where *C. olitorius* is grown, for the climate over Western Bengal differs materially from Eastern and Northern Bengal in the comparative scantiness and lateness of its spring rainfall. Such conditions seem to suit *C. olitorius* much better, as a rule, than *C. capsularis*, which usually makes heavier crops after early sowing. For this reason a separate scheme of selection for *C. olitorius* is in progress in the *desi* districts.

I should mention that alongside of this investigation the demonstration staff are, under instructions from Mr. Blackwood, teaching the cultivators to take seed from the tallest plants in their fields for the next year's sowing. In the case of badly mixed crops, such as is the rule in some districts, the systematic mass selection of the tallest jute plants is likely to produce better crops on the whole. Mr. Blackwood recognises the limits of the scheme and if our pure lines are shown to be better than the local jutes they will be substituted for the latter. Apart from any question as to its value from the point of view of seed selection the scheme is a useful object lesson to show to the cultivator that his own methods though often very good, are capable of improvement by the Agricultural Department.

I have described how we hope to progress towards growing the heaviest yielding races throughout the jute-growing tracts; there still remains the question of quality which involves strength and durability of fibre. At the commencement of the investigation some time was spent in looking for plants which combined both yielding power and quality in the highest degree; but only partial success was met with. Thus, while the pure races which we are now distributing, besides being heavy yielders produce excellent fibre, there are others which

are better in this latter respect, both as regards cellulose content and length of ultimate filament. It may be possible to combine all these qualities in a hybrid and preliminary experiments in this direction were commenced three years ago; they were held up for two seasons during the period of my leave; but it is hoped that some observations may be made from the seed which has been sown this season. These are the lines on which the improvement in the yield and in the quality of the jute fibre is being attempted. Progress has necessarily been slow but it has been none the less real and it is bound to become more rapid in the near future.

(*b*) *Cultivation and manuring.*—It is probable that anything which may be said in this connection about jute would be true in reference to most crops in India. The first idea which occurs to us is that the cultivation implements used are not by any means the most efficient, or the most economical; but we usually find that there are grave difficulties in the way of effecting a change. For instance, there is no doubt that, granted draught animals only a little more powerful than those at present available, the country plough could be replaced with advantage both as regards speed and efficiency. But until some widespread improvement is produced in the cattle of the province it is hardly possible to hope for much in this direction. Again, for operations subsequent to the first ploughing, the spring-tined harrow is just as efficient as the plough, while doing three times as much work; but its cost is considerable and at present only a wealthy cultivator could afford it. The development of Co-operative Credit which is proceeding with considerable rapidity in several parts of the province will however remove this bar. The Department has not yet had time to demonstrate the obvious advantage of the spring-tined harrow in the districts; but this will be done as soon as possible.

The most critical and the most expensive operation in connection with the cultivation of jute is undoubtedly the weeding and thinning, which, in a wet year, when the *achra* or rake cannot be used, may easily cost as much as Rs. 20 per acre. Of course a great deal undoubtedly depends on the condition of the land, its previous treatment and the crops it has grown; I have seen a thickly sown jute crop on good land grow at such a rate as to practically stifle all weed; but even then it is necessary to thin the crop, which is the most tedious part of the operation. Nevertheless, a quickly growing crop is an obvious advantage and preliminary trials at Dacca this year have placed it almost beyond doubt that a small dressing of a soluble nitrogenous manure is most efficacious in producing such a rapid development. I think I remember hearing from Mr. Clouston that a similar result was obtained by him in trials with jute in the Central Provinces. It is, I know, generally considered that the application of a very soluble nitrogenous manure in a wet climate is unwise, but it has to be remembered firstly that the amount applied is not more than ½ maund, *i.e.*, from 5-7 pounds of nitrogen per acre and secondly that, while the showers in March and April are often heavy, there are, in an average year, frequent intervals of fine weather often of several days or even more than a week in duration. It is worth remembering that the securing of a rapid growth through the first two or three inches of its height has another great advantage in addition to the keeping down of weed. It carries the plant past a period when it is peculiarly liable to suffer not only from the effects of insects but of even temporary excessive moisture in the soil. In this respect the top-dressing of turnips and of oats in Europe is a parallel.

In regard to the thinning of the crop, preliminary trials have already shown that an undoubted advantage would be to sow the crop in lines; for, not only is more thorough cultivation with the *achra* (bullock rake) thereby greatly facilitated but the use of implements akin to the European turnip hoe, with which the speed of working would be doubled or trebled is rendered possible. The drilling of ordinary field crops with either a bullock-drawn, or hand drill according to the size of the field, configuration, etc., has already been proved to be a very feasible operation, which we estimate might, besides saving seed, reduce the average cost of weeding to less than half.

It is worth noting that a cable-drawn drill for jute is already being used with success on Messrs. Birkmyres' estate in Assam.

Drainage, etc.—A good deal of prominence has recently been given to this subject by Mr. Howard and my experience is that in Bengal, especially for the young jute crop, which is extraordinarily sensitive to water-logging whether partial or complete, good drainage is very essential, even on the high lands. The cultivator's appreciation of the effect of excessive dampness in the soil seems to vary in different districts. In S. E. Mymensingh, for instance, most jute fields are carefully drained so as to avoid, as far as possible, any water-logging due to differences of level; but in other districts it is common to find fields, one portion of which, by careless cultivation, has been made lower than the rest. In a normal year, most certainly in a wet year, such a low portion is bound to suffer partly because of the direct action of excessive moisture in the soil and partly because the land never becomes dry enough to allow of weeding and thinning.

In a wet season like the present, the beneficial effect of the drainage made itself particularly evident at the Dacca Farm, especially in cases where sowing was unable to be done early. In the latter case the drainage has enabled a good normal growth to take place when failure would otherwise have been inevitable. It is worth noting that diseases like Rhizoctonia seem

much more prevalent in badly drained land as distinguished from land flooded with moving water.

Owing to the heavy rains special precautions have to be taken especially on high well drained land to avoid the danger of erosion. The violent Nor'Westers which frequently break over Dacca in the spring are often followed by torrential rain during which a large portion of the surface soil may be washed off a field in the course of an hour. That the larger aspect of drainage and erosion is a very important one in Bengal and that it affects not only jute but all sides of the life of the people is well known but it is doubtful if it could be profitably discussed here at greater length.

Cutting and steeping.—In these operations, which are also expensive, the only improvement capable of immediate application which suggest itself is a heavier knife, more of the nature of the scythe, by means of which the cutting operation could be shortened and therefore cheapened. At present the only implement used is the small sickle with which a minimum of twelve men are required to cut and bundle an acre a day. Reapers are, unfortunately, practically out of the question over the great bulk of the jute tract partly on account of the small size of the fields and partly also because of the inundation of the land during the rains. There would otherwise be no real difficulty, for, I have seen an ordinary reaper doing sufficiently good work on jute to show that a very slight modification would suit for this purpose.

In the actual retting process it is difficult to suggest any improvement, either as regards speed or efficiency, which would not involve a complete revolution. It is well to remember however that only very simple machinery is required to take off the fibre-bearing layer of jute and thus reduce its bulk to roughly one-third. A further quite simple chemical and mechanical treatment brings out fibre in the course of an hour or two which, while very markedly stronger than that obtained by the ordinary retted process, is equally suitable for spinning. While such methods are obviously beyond the ryot at the present stage it should not be forgotten that the only reason for the failure of several otherwise very successful experiments with jute outside India, in the Southern States of America for instance, was the difficulty of the retting and stripping and the prohibitive cost of the labour required for it. The official report of the United States Agricultural Department concludes that a suitable artificial process for the extraction of the fibre would solve the question of jute cultivation as far as America is concerned.

Manuring.—Alongside the seed selection experiments with jute an investigation into the manurial requirements of the crop has been made. Jute is a very quickly growing crop and granted proper drainage conditions its progress depends on the quantity of plant food which is immediately available. The manurial investigation is not by any means complete of course; but we have already obtained valuable information which has been sufficiently tested to allow of its demonstration to the cultivator.

Taken as a whole, the soils of Bengal may be said to be seriously lacking in lime and phosphoric acid. There are exceptions in parts of the Rajshahi Division, where the conditions are apparently transitional between the chalky lands of Bihar and the neutral or acid soils of Eastern Bengal; the same may also refer to parts of the Sundarbunds. On the other hand the red soils of the Bahrind tract in Western and Northern Bengal and of Madhupur jungles in Mymensingh and Dacca are, as Mr. Meggitt's analyses have shown, quite strongly acid. As the soil of the Dacca Farm is of this latter type, a good deal of attention has been given to it. On these lands the effect of lime and of basic phosphates is phenomenal. On the series of plots in Shooti field 30 maunds of lime per acre in one season gave an average increase of 4 maunds of jute per acre in each of three successive years and the application of bone as a phosphatic manure enabled a heavy crop of mustard (5 to 6 maunds per acre) to be grown on the limed plots when the untreated ones were practically bare. The balance sheet of these plots up to date shows an aggregate credit balance of Rs. 146 in 3 years after paying for all extra manure applied, corresponding to an annual net increase of very nearly Rs. 30 per acre. The increase in the first crop of jute paid for the whole cost of the lime applied while its effect lasted for 3 years. In the present season demonstrations have been made in two or three cultivators' plots outside the Dacca Farm and the effect of the application is obvious. In one plot it will probably be rather less than the average for the farm plots but in a second case the increase is considerably greater. There seems little doubt that this treatment is capable of increasing the yield of jute, and incidentally of other crops to an average extent of 10 to 15 per cent. With the view of making it easier for the cultivator a series of plots has been laid down this year to decide whether smaller quantities of lime applied oftener, would not be as effective as the large quantities at present used. This is an important point; because if 10 maunds per acre would produce approximately the same effect in the first year as 30 maunds, it would involve a considerably less immediate outlay on the part of the cultivator even though the dose might have to be repeated in the second and certainly in the third year. The plots so far seem to indicate that the smaller quantity of lime will produce a well marked effect, which is what is required.

Application of Potash.—It is well known that a cultivator, especially in acid soil tracts, takes great care of his household refuse, including all fuel ashes, which he applies alone, or mixed with cowdung, to the land. The custom is very common at Dacca and it seems to have

occurred to Mr. Meggitt at much the same time as to myself that the effect of such applications must ultimately help materially in improving the soil. Certainly the ryot often raises quite a good mustard crop, for instance, without any direct application of lime or of phosphate other than that contained in cowdung whereas it would, as I have already said, be impossible to do such a thing on the ordinary land of the Dacca Farm. Mr. Meggitt has published results showing that carbonate of soda produces an appreciable effect at Jorhat and that the application of wood ashes also has a beneficial effect. In view of this it occurred to me that the effect of lime on cultivator's land might not be so marked as on the Dacca Farm and a series of plots was therefore laid down to ascertain the effect of the chief constituents of wood ashes. Duplicate plots of land which had been limed and phosphated were treated with carbonates of soda and potash respectively, while other check plots did not receive either alkali. Judging from appearances the potash has had quite an extraordinarily favourable effect which is obviously much greater than that of soda, and Mr. Meggitt informs me that similar experiments at Jorhat have produced identical results. Having regard to this and also the fact that the land had already been limed it would appear that the action of the potash has been at least partly that of a specific plant food as well as to help in neutralising the natural acidity of the soil; in any case, the cultivator's action is once more well justified. The crops which have received potash are not only taller with darker coloured leaves but the stems of the jute plants are markedly thicker throughout. It is rather curious to remember that I have, on two previous occasions, tried neutral salts of potash but without marked result though, in potcultures, potash seemed to encourage the lengthening of the ultimate filament of the fibre. It would of course be impossible, on account of its cost, to apply carbonate of potash, as such; but if it were necessary the sulphate could easily be mixed, before application, with rather more than its own weight of good slaked lime. Further information will be available on this point later.

Green Manuring.—We have as yet obtained no quantitative results for the action of green manures on jute. If green manuring is to be taken up readily in Bengal it must, I am sure, not involve the loss of a crop as in the case when *dhaincha* (*Sesbania aculeata*) is used. Fortunately, cowpea offers a promising solution of this problem; as we have found that it can be grown quite successfully as a catch crop between an early *Aus* paddy and the rabi crop. This is a proposition which it might easily be worth the while of the cultivator to consider. *Dhaincha*, ploughed in deep in the ordinary way, never seemed to produce anything like the results at Dacca which its nitrogen content would indicate. The rainfall at Dacca is heavy and if a large quantity of organic matter is ploughed deep into a heavy water-logged soil it seems highly probable that an anærobic acid fermentation would take place which might easily result in the loss of a large proportion of the nitrogen. Mr. McLean and I have therefore commenced a series of experiments at Dacca to compare the results obtained by ploughing in deep on the one hand and merely breaking up the crop on the surface on the other. For cowpea in such a damp climate as that of Dacca, it is sufficient to pass the *henga* or ladder twice or thrice at intervals of a day or two. A week or ten days afterwards, as Mr. Hector has demonstrated this year in his area, the spring-tined harrow can be used without difficulty to stir the surface and keep down weeds. If cut young enough, say not more than 4 ft. high, *dhaincha* or *sunn* should not be much more difficult to treat on the surface but with a view to experiment in this direction a disc harrow has just been added to the stock of implements at Dacca.

A common custom in the great jute-growing tracts of Pabna and Mymensingh is to sow Sunn-Hemp as a cold weather crop and either to feed it off to cattle on the land or, much more rarely, to plough in the whole crop. The beneficial effect of the practice on the succeeding jute crop apart from the fact that it provides valuable fodder for cattle just when green food is scarce, is estimated at anything up to a 50 per cent. increase in the yield of fibre. This is an item of improved cultivation of demonstrated value which the Department is attempting to introduce to the ryot in tracts where it is not at present practised.

Action of phosphates on jute.—At Dacca, phosphates have shown no very marked effect in producing increased height in jute; but there have been indications that jute grown on phosphated land contains a larger percentage of fibre, a result which would tend equally towards increasing the yield of the crop. On the other hand, at places as far apart as Rangpur, Faridpur and Bhairub bonemeal on unlimed land has produced a marked influence, not only on the stature of the plant but also on the yield of fibre. These promising experiments are being continued. It is hardly necessary to point out that cold weather crops like pulse or mustard benefit greatly from the action of phosphate applied to the jute crop.

While dealing with phosphates it may be mentioned that flour phosphate (ground rock phosphate) promises to prove itself the equal of bonemeal on the Dacca soil. Some of these rock phosphates contain nearly 30 per cent. of phosphoric acid equivalent to approximately 50 per cent. phosphate of lime, as against about 24 per cent. of phosphoric acid equal to approximately 50 per cent. phosphate of lime in bone. The phosphate is very finely ground and it is quite easily available in lands of the Dacca type. Of course it contains no nitrogen, of which bone has about 4– 4½ per cent.: but its present price is Rs. 50 per ton as against Rs. 75 per ton for bone. It is sold by Messrs. Shaw Wallace & Co.

Conservation of cowdung.— I have already remarked that jute is a rapidly growing crop. The green weight of a good crop of jute commonly amounts to 20 tons, say 500 maunds or more, of green matter per acre, in a growing period of less than of four months ; and the best results are obtained, as I have already remarked, where the methods of cultivation and manuring may be described as intensive. In view of this, it is obviously advisable to eke out the supply of cowdung to the best advantage ; but the securing of such a desirable end involves the making available, as a manure, as large a proportion as possible, of the tremendous amount of nitrogen which is wasted in Bengal as well as in other parts of India, on account of the use of cowdung for burning and other purposes. The loss is of course greatly aggravated in Bengal by the heavy rainfall. In a soil not lacking in lime the effect of cowdung on the yield of jute is far greater than the value of a corresponding amount of the manure used as fuel. On this account it is for jute at least as, if not more, important than for any other crop, that the wastage of cowdung should be curtailed as far as possible. With the aid of Babu Rajeshwar Das Gupta, Superintendent of Agriculture, I made a beginning in this direction four years ago by persuading cultivators in the Bhairab district to keep their manure in pits protected by a rough shed ; the idea has developed and the conservation of cowdung is now one of the Departmental demonstration items. Last year nearly 500 pits were dug and the practice will undoubtedly spread as, apart from avoidance of loss due to physical agency, the superiority of pitted manure is well known.

Water weeds.—While dealing with the subject of manures for jute it is worth while mentioning a subject which is attaining considerable prominence in Bengal at the present time :— I refer to the growth of water weeds in the *khals* and *bheels*, which has increased so much recently as to threaten to become a serious hindrance to navigation in these channels of communication. The Narayangunj Chamber of Commerce approached His Excellency the Governor of Bengal at whose instance an investigation was commenced. The weeds, some of which were mentioned a few years ago by Mr. Meggitt as possible sources of manure, have been found to be surprisingly rich in plant food ingredients. On the dry weight preliminary analyses have indicated the contents to be as follows for different specimens :—

Nitrogen	from	1·3 %—2·5%
P_2O_5	,,	0·60%—0·95%
K_2O	,,	2·8 %—7·6%

There can therefore be no doubt that the eradication of the weeds will pay for itself in their value as a manure ; indeed the problem seems to have opened out a possibly useful future application for the plants.

In view of the rapid choking of water-ways with the weeds and the consequent blocking of practically the only means of communication in some portions of the Dacca district, due publicity will be given by Government to the information regarding the manurial value of these weeds. Any extension in their utilisation for this purpose, besides improving the water communications, will of course confer a corresponding benefit on the crops of the district.

I have now described in more or less detail the cultivation and production of jute. Beginning with the seed the methods employed for its improvement have been outlined as also the means by which the improved races are being tested against local jutes and their value demonstrated to the cultivators. It will have been seen that considerable knowledge has accumulated regarding the manurial requirements of jute and that some items of this knowledge, notably the beneficial effect of lime and phosphate on acid red soils ; the effect of phosphates in other tracts like Rangpur and the value of cold weather green manure for jute as practised in Mymensingh and Pabna are being demonstrated, or are ready for demonstration, to the cultivator. A definite start has also been made in persuading cultivators to conserve their cowdung, other items such as catch crop green manuring, application as top dressings of small quantities of soluble manures to the young crop, and the effect of potash are all likely to be ready for demonstration within a short time. There is thus no doubt regarding the necessity of a large and efficient district staff for demonstration purposes and proposals are at present on foot for a considerable extension of the present organisation, which consists of the two Deputy Directors and, under them in respective grades, one Superintendent of Agriculture, in each division, District Officers whose activities are confined to administrate districts, and demnostrators, who are men of the cultivating class who have recei ed a year's training in one of the farms. The proposals for extension aim at the ultimate appointment of a District Agricultural Officer in every district and a demonstrator in each *Thana* but in the meantime permission is asked to bring up the establishment of 17 District Agricultural Officers and 169 demonstrators. We have no doubt that there is work for such a large staff but it seems doubtful at present whether there is enough supervision. It cannot be expected that one year's training on a farm will make an experienced demonstrator ; and visits to the various test plots and demonstrations during the present season have convinced us that we have still a good deal to learn in these matters. It is only recently that Mr. McLean has joined us as Deputy Director of Agriculture and his appointment has only served to still further open our eyes to the urgent necessity of more adequate European supervision of the demonstration work. We, I speak now for the officers at Dacca, are convinced that the appointment of another European Deputy

Director of Agriculture for the Rajshahi division is imperative and that a 4th appointment for the Chittagong division should be contemplated as an early contingency if the demonstration there is to have the organisation and supervision it requires. If any confirmation of these views is required it is to be obtained in the opinions expressed in the report of the Bengal District Administration Committee. They are as follows :—" But without a considerable strengthening of the European demonstration staff such results can never be hoped for in Bengal. In view of the fact that even the existing demonstrating organisation has yet to gain its experience we feel that the appointment of a very large number of subordinate officials without proper supervision would be a mistake. On the other hand we would rather see the Deputy Directors of Agriculture appointed for their respective tracts with a free hand to build up an efficient staff suited to their local conditions. To first of all appoint the subordinates seems to us to be beginning from the wrong end."

Co-operative Credit.—I have already mentioned that we must look to the co-operative credit movement for the financial aid which will be necessary if a number of improvements such as the use of manures, implements, etc., are to be taken up by the ryot. Fortunately, if one is to judge by the progress already made there will be little difficulty about this. Starting with the co-operative purchase of bonemeal a few years ago there are now ten small village banks clustered round the Dacca Farm. In the present season these banks have purchased 120 maunds of bonemeal and for next year orders have been placed for 500 maunds.

At Bhairab there are several small banks which have already given orders for about 100 maunds of potato seed for the coming season and similar conditions prevail in Faridpur and Mymensingh. All these districts are in the division superintended by Babu Rajeshwar Das Gupta who has shown great energy not only in this but in other directions of his work.

The co-operative movement is also making progress in the Rangpur district where there are banks of 40 or 50 members each.

Thus, there appears to be every reason to hope that the Agricultural Department will receive all the aid it needs in this direction.

Extension of the area under jute.—In considering this part of our subject it is instructive to note the rate at which the cultivation of jute has increased in recent years. In 1874 the approximate area under jute was given as 9,20,000 which at 3 bales per acre would yield 27 lacs of bales roughly. In 1902-03 the official figures give an outturn of 66 lacs of bales ; in 1904-05, 72 lacs of bales ; in 1909, 90 lacs ; in 1910, 81 lacs ; in 1912, 100 lacs ; and in 1914-15 105 lacs. Thus the actual amount of jute produced has increased by nearly 50 per cent. in the last 10 years and the same may be taken to be true as regards the area under the crop. In Hem Chandra Kerr's report, written in 1874, it is stated that jute was cultivated in all but 11 districts of the old Presidency. Only one of these districts grows jute today and that on a very small area. Obviously therefore there has been no expansion of the limits of the tract of country over which jute is grown inspite of the enormous increase in actual acreage under the crop. It follows that the proportion of jute to other crops has increased very greatly in this tract. In the districts of Dacca, Mymensingh, Faridpur and Tipperah the area under jute is over 25 per cent. of the net cropped area ; in Bogra, Pabna and Rangpur it approximates to 20 per cent. while in the 24 Parganas, Nadia, Jessore, Hoogly, Howrah and Rajshahi it varies from 10 per cent. to 15 per cent.

In the whole province of Bengal jute occupies 12 per cent. of the total cultivated area. It is difficult to say how far the forecast figures for the rice crop are accurate but such as they are they indicate a drop of 1,700,000 acres, or 8 per cent. in the area under rice between the years 1910-11 and 1913-14. In any case it would appear that, in spite of a considerable increase in the population, and comparatively high prices for the grain in the period mentioned there was a serious decline in the cultivation of the principal food crop of the province. While it would be very dangerous to generalise too widely on the singificance of such figures, for instance, the returns for the year 1914-15 indicate that there was a considerable though far from complete recovery in the cultivation of rice, it seems safe to say that the large extension in the area under jute has undoubtedly displaced the cultivation of food crops to a considerable extent and that any further large increase of jute must still further curtail the food producing area. How far this process can go on without introducing a serious economic danger is a question which I do not pretend to be able to discuss in all its bearings but there are many whose opinion is that such a danger is imminent.

Another aspect is of greater importance than it appears at first sight, *viz.*, how far the present labour supply is capable of dealing with a largely increased substitution of jute for other crops in the present jute growing tracts ; for, it cannot be doubted that jute cultivation involves considerably more labour than rice. People who have been in the jute trade for many years are almost unanimous in believing that the quality of jute brought into the market has not been so good in recent years. Of course there are spasmodic variations in qulality which are due to seasons which are suitable or otherwise ; but, there is a strong and general impression that outside this, there is a tendency towards continuous deterioration. That this is not due to the plant is certain. It is possible to grow as good jute today as ever it was,

and given good retting water and careful preparation, the results are entirely satisfactory. It has already been remarked that jute cultivation involves considerably more labour than rice and the reaping of the crop and preparation of the fibre is one of the most exacting stages in its production. If, therefore, the cultivator is coming to a point when he tries to cultivate more jute than he can conveniently manage one of the most obvious signs will be a tendency towards more and more careless preparation and this is just what appears to be happening.

This difficulty is to some extent mitigated by the employment of outside labour, for every year large numbers of coolies migrate eastwards from the over-crowded districts of Bihar and the United Provinces, more especially to the jute growing districts of Northern Bengal. The supply of such labour however is not only limited, but it is expensive and through lack of experience is often inefficient. The result is an inevitable rise in the cost of production of jute as well as a deterioration in the quality of fibre obtained.

There appear therefore to be some reasons for the contention that, as far as actual area is concerned, the present jute producing tract is approaching its limit. There is certainly no ground for believing that the demand for jute is likely to slacken more than temporarily and it behoves us to examine the position in order to see how this demand is to be met. There are three possible ways, *viz.* :—

(1) By improving the yield of fibre in the present jute producing area.

(2) By extending the cultivation of jute to other tracts where it is not at present grown.

(3) By the cultivation, in tracts which are not suitable for the production of jute, of other plants whose fibre is sufficiently similar to be used as a substitute for jute.

Taking these points in order :—The work of the Agricultural Department must lead to considerably enhanced yields, not only of jute but of other crops by means of improved methods of cultivation and manuring. The ultimate possibilities in this direction, as far as jute is concerned, may be put at something like 20 per cent. or say 20 lakhs of bales ; but the actual realisation of this increase will be slow, for not only are the cultivators conservative but their number is very great, their holdings small and they are spread over an area as large as Great Britain.

Regarding new areas in which jute cultivation could extend :—The natural outlet would of course be the plains of Assam which are, by reason of the prevailing conditions of soil and climate, peculiarly fitted for jute cultivation. There is indeed little doubt that this tract is capable of supporting at least another million acres of jute without unduly straining the proportions between jute and other crops. The lack of population in much the greater part of Assam, is however an almost insuperable bar in the way of any rapid extension and, although numbers of Bengalis from the crowded southern districts are beginning to emigrate to Assam, it would appear that by nothing short of a wholesale colonisation scheme can progress be made otherwise than very slowly.

In Bihar, Purnea is a very large jute producing centre but Cuttack is the only other district which grows more than 10,000 acres of jute. High prices in the years 1905-06 caused about 10,000 acres of jute to be grown in 1907-08 in the districts of Mazafferpur and Champaran, but the area fell again later, partly owing to lower prices and partly to lack of market facilities. Since then jute cultivation has again shown a tendency to increase but not to the extent which these areas are capable of supporting it. There are large areas in North Bhagalpur and probably also along the Terai in North Darbhanga where the production of Jute could almost certainly be made profitable. The edges of the numerous *char* or depression in Tirhoot, where sowing could take place early in the year— in February— are, as I know, capable of growing very fine crops of *C. capsularis*. The fact that such land goes under water to the depth of even 6 feet has its parallel over large areas of the greatest jute growing tracts in Bengal. It is not even necessary that a pure crop of jute should be grown ; a common custom in portions of the Dacca district is to broad-cast rice and jute together, the value of the respective yields being from one-third to half for the jute and from one-half to two-thirds for the rice. Thus, while a food crop is assured the monetary return is almost uniformly better than that from a pure rice crop. Such a practice is worth trying in Bihar. Another point worthy of investigation is how far *C. olitorius* could be grown on the higher lands. The *desi* jute in districts near Calcutta is not often, on account of scanty rainfall, sown until late in May or even the beginning of June. Such conditions approximate quite reasonably closely to those of Bihar and I believe that the production of successful crops of *C. olitorius* in good high lands there to be more than a possiblity. In most parts of Bihar cheap water communication with Calcutta is a very great advantage to start with.

Experimental jute has been grown with success under irrigation in most parts of India notably in the Central Provinces, the East Coast Deltas of Madras and the Punjab. *C. olitorius* was particularly successful with Mr. Clouston in the Central Provinces, and I understand he still has hopes that its cultivation may be taken up to some extent in the areas commanded by the irrigation schemes in that province. Considerable success was also met with by Dr. Barber

in the Godaveri Delta in Madras where the conditions approximate in many respects to those of the Mahanadi Delta in the Cuttack district. Some very fine crops were grown at Lyallpur in the Punjab by Mr. Dobbs ; but here it is probable that difficulties would arise in regard to retting water.

Jute substitutes.—The question of jute substitutes is one of considerable interest. There would be no object of course in introducing such a substitute into Bengal which is the home of jute ; but there are plants whose fibre approximates closely to that of jute which are capable of thriving under conditions, which would be quite unsuitable for jute. Of these, *Hibiscus cannabinus*, which is to be met with in cultivation in nearly every part of India, is the most promising. Its fibre, as I have said, is similar in many respects to jute although, naturally enough, it is not looked on with favour in Calcutta. It has, nevertheless, especially certain varieties of it, a stronger and probably a more durable fibre than jute and for this reason alone, if for no other, its cultivation is worthy of encouragement. It is produced in a considerable scale in Madras where there is a fluctuating area of between 50,000 and 80,000 acres in the East Coast districts. A gunny mill whose annual consumption is said to be about 25,000 bales has existed for many years at Bimlipatam and it was proposed to erect another one at Ellore in the Kistna district. It is worth noting that *Hibiscus cannabinus* is also cultivated throughout Bombay and especially in Bihar and the United Provinces, so that a comparatively small percentage increase, over such a large area, would have a very considerable effect in the aggregate supply of fibres of the jute class.

During the last ten years, I have consistently advocated the merits of *Hibiscus cannabinus* fibre as an acceptable substitute for jute and at the expense of some repetition it seems advisable to recall the actual facts.

At the beginning of this note it was shown that a considerable shortage in the supply of jute in the period 1904-06 had led to high prices and a very large amount of fraudulent watering in consequence of which Government has faced with a demand for penal legislation. It was wisely decided that the adjustment of the discrepancy between supply and demand by the production of large quantities of fibres of the jute class was the real remedy and the efforts in regard to the improvement of jute in Bengal are one result of this policy ; but in view of the profit to be obtained from the cultivation of fibres it was considered advisable to investigate the possibilities of other parts of India in this respect. In 1905, at the instance of Mr. F. G. Sly, I.C.S., then Inspector General of Agriculture, I made an extensive tour through India with this object in view and an account of the tour was published in Bulletin No. 3 (1906) of the Agricultural Research Institute Pusa.

The recognition of the possibilities of *Hibiscus cannabinus* as a substitute for jute was one of the most important results of this investigation, as the following quotations show. ".... it (Hibisous) possesses the properties which render it a reasonably efficient substitute for jute. It can be grown with success under the conditions of soil and climate which obtain in most parts of India and consequently is capable of much greater extension than jute which requires, it would appear, more favourable conditions of soil moisture for its development." In Madras, "..... it is capable of being produced in such a scale as to afford considerable relief to the present position of the jute trade."

" But it is not only in Madras that Bimlipatam jute can be successfully grown as a pure crop. It is common throughout Bengal, Bombay, Bihar and the United Provinces as a mixed crop and as the figures already quoted show that its cultivation as a pure crop returns a good profit — better than most other field crops — there is no reason why there should not be an almost unlimited supply of its fibre."

In Madras where *Hibiscus* is grown as a pure crop there are two or three types of which a straight growing red variety called *Yerra Gogu* is considered by cultivators to be much the best as a fibre producer. An investigation of these races of *Hibiscus* was originally undertaken about 1905 in collaboration with Dr. Barber, Government Botanist, Madras, but ultimately the seed samples were handed over to Mr. Howard of Pusa who has produced pure cultures and investigated the conditions under which the crop must be grown to avoid contamination by chance crossing. The Department is thus practically ready to supply pure seed of the best kinds of *Hibiscus* in quantity to the cultivator.

It is important to observe that spinners in Europe who are in the habit of using Bimlipatam jute, speak well of it.

There is a considerable export of the surplus *Hibiscus* fibre under various names such as Bimlipatam jute, etc., from Madras to London and Dundee where it is a recognised item in the jute markets and where it is bought for purposes for which jute would otherwise be required. The buyer of jute is thus relieved of a corresponding amount of competition. It is worth remembering that in this case also it is by no means necessary to grow a pure crop of *Hibiscus cannabinus* ; indeed, excepting in Vizagapatam, parts of Eastern Bengal and of the Purnea district, it is more commonly mixed with food crops.

I think I have now said enough to show that there are possibilities for the production of jute or of fibres similar to it, in parts of India outside Bengal, or the portions of Bihar and

Assam where jute cultivation is already carried out on a large scale. No one will deny that jute has brought great riches to this latter tract; but there are indications that it is approaching its limits. In view of this, I suggest that the investigation commenced in 1905-06 be re-opened to determine finally the possibilities of other parts of India and especially Bihar and United Provinces as regards the cultivation either of jute or of similar fibre. It is possible that while the war lasts the demand for jute will not be so great as it was before hostilities commenced. Moreover there may be a considerable period of trade depression after peace is declared; but ultimately we are bound, I think, to see a recrudescence of the demand for sacking fibres. I submit that the interval is a favourable time in India for establishing a policy in this on a basis of experimental results. There is a strong probability that artificial fibre is already being used to some extent by Germany for sacking; and the recent complete shutting off of supplies of jute will render the production of artificial fibre on a large scale a necessity. Mechanical wood pulp at £5-£7 per ton, straw at £1-10 to £2 per ton and even saw dust are possible raw materials, and all are cheap enough to allow an artificial fibre to be placed on the market at a low price even after a fairly elaborate chemical treatment. An expenditure of £5 per ton on chemicals could be made to work wonders on what might at first appear to be most unpromising stuff. A period of shortage of jute accompanied by high prices immediately after the war would be an ideal opportunity for such a fibre to work its way into foreign markets where it has no opportunity of competing with jute at present.

N. B.—Since the above remarks were written an article entitled "The Manufacture of Yarns and Textiles from Paper Pulp" has appeared in the June Number of *Indian Industries and Power*. The article describes how strips of paper, made from Sulphite pulp at £7 to £9 per ton, are twisted into yarns and shows that paper pulp yarn of this type can be placed on market at about £15 per ton. In his calculation of the cost of production of jute yarn the author takes £10 to 14 per ton as the price of raw jute. It is hardly necessary to remark that, in the period between 1910 and the beginning of the war, the normal price of Jute was much nearer £24 per ton than £14; but even at the latter figure the price of jute yarn would average about £18 per ton. The great fault of the paper yarn is that it loses strength when wetted but it does not require a very deep knowledge of cellulose chemistry to realise that such a defect has remedies which could in all probability, be applied and still leave the pulp yarn a substantial advantage in price over jute yarn. The article contains the following significant paragraph:—

> "There is little doubt that this industry has been carried on for some years now upon the Continent of Europe with fair profit to those engaged in it, and that the use of various descriptions of materials made from paper pulp yarn is on the increase. The lines of trade for which the yarns are suitable appear to have been located and the establishment of works to make the machinery needful in their manufacture in England is a sign that the trade is spreading in Great Britain. When decorated with colours the materials look very pleasing."

Without indulging in gloomy predictions it may safely be said that India's virtual monopoly in the production of fibres of the jute class is in much greater danger of disappearing to-day than it was 10 years ago when the policy of extension was first brought forward as a serious proposition. Very little in this direction has been done in the meantime and it seems still more advisable now than it was then that the possibilities of likely tracts should be investigated both in regard to their capacity for fibre production and also the economic inducement offered by the latter as compared with other local crops.

APPENDIX B.

Cotton improvement in the Central Provinces and Berar.

By Mr. D. Clouston, m.a., b.sc.

(*Deputy Director of Agriculture, Central Provinces.*)

Steps were taken by Govermment to improve the cotton industry in the Central Provinces in the sixties. A Cotton Commissioner in the person of Mr. Rivett Carnac was appointed at that time in response to urgent appeals from Lancashire for more cotton of good staple. He did much for the cotton trade in the Provinces by improving communications by road and rail, by checking to some extent the adulteration of cotton and by encouraging the use of baling presses.

2. His efforts to improve the crop itself, either as regards quality or outturn were not successful. He started on the assumption that it was an improvement in quality rather than in quantity that was wanted. The two kinds of cotton grown in the Provinces at this time were *bani* and *jari* ; but as *jari* was by far the better yielder of the two, it was rapidly taking the place of *bani*. The lint of *bani* suited the requirements of the Lancashire market, and the Cotton Commissioner naturally assumed that the extension of *bani* would be in the interests of all concerned. Thousands of maunds of seed of this *bani* cotton were distributed by him, among cultivators for sowing purposes. The results were disappointing. It gave a poor yield, and the middlemen who purchased the unginned cotton (*kapas*) gave less for it than for the *kapas* of *jari*.

American cottons were tried with the same end in view, namely, to get a long stapled cotton suitable for Lancashire.

3. When I came to India about ten years ago attempts were still being made to extend *bani* cultivation. By this time, however, its defects as a cropper were so widely known, that the area under it had decreased to a few thousand acres. It was only to be found growing in villages very far from the railway, where there were no ginning factories, and where cultivators were therefore compelled to gin and sow their own hand-ginned seed year after year. The method adopted by the Department of Agriculture to get the cultivators to grow this cotton at this time was as follows. The Managers of certain ginning factories were asked to keep for the Department all the seed obtained by them of this variety. That seed, amounting to many thousands of maunds was then taken over by the Department for distribution in the cotton tract. Very few cultivators, however, agreed to take the seed : those who did reported later that the crop produced was very poor, as this variety gave a small outturn of *kapas* and a very low percentage of lint to seed.

4. In 1906, I completed the classification of the Central Provinces cottons and found that the so called *jari* or *katevilayti* was not a pure variety, but a mixture of varieties all varying considerably in the quantity and quality of lint which they yielded. The mixture consisted of Upland Georgian—an American cotton of the Upland type, of *bani*—an *indicum* which, as I have already said, was still being grown as a pure variety in localities far from the railway, and of four *neglectums*, namely, *Neglectum roseum*, *N. roseum cutchica*, *N. Malvensis*, *and N. Verum*. Each of these pure varieties was grown on a separate block on the experimental farms in 1907, and a series of experiments was also started on the Akola Farm to ascertain their relative outturns in *kapas* and lint. It was anticipated that *Malvensis* would prove to be the most profitable cotton as the lint was nearly as good as that of *bani* and the percentage of lint to seed was 33, while for *bani* it was only 26. From the results of these varietal tests, however, it soon became evident that *roseum* was by far the most profitable cotton for the cultivator to grow, as it gave both a big outturn of unginned cotton and from 39 per cent. to 40 per cent. of lint to seed. The experiment has now been carried out continuously for eight years and the following very definite conclusions have been drawn from the results obtained :—

(1) that *roseum* gives on an average more than twice as much lint as *bani* ;

(2) that it gives on an average over 40lbs. of lint more than the mixed cotton known as *jari* which formerly occupied at least 99 per cent. of the cotton area of the Provinces ; and

(3) that Upland Georgian is a very unprofitable variety.

Compared with *jari* *roseum* gave an increase worth Rs. 10 per acre, while compared with *bani* the increase was worth Rs. 22 per acre. These profits were based on the prices paid for our cottons by Sir Bezonjee Dadabhoy, Manager of the Empress Mills, who paid about 25 per cent. more for the lint of *bani* than for that of *roseum*. When samples of the same cottons were sent home for valuation, *bani* was valued as being worth only about 8 per cent. more than

roseum. At home prices, therefore, *roseum* would have been still more profitable as compared with *bani*.

Roseum tested against *jari* in hundreds of villages has given an average increase worth over Rs. 6 per acre ; the increase in this case though smaller than it was on the Akola Experimental Farm where the average outturn is much greater, was still sufficiently large to impress the cultivator. Its superiority has been admitted wherever it has been grown and it has gained a name for itself all over the cotton tract of the Central Provinces and Berar. Though millions of pounds of seed have been produced in a single year, the supply has fallen short of the demand. The success of our seed farms and Co-operative seed nurseries in the cotton tract have been very largely due to the merits of this cotton. There were some cotton seed farms distributing *jari* seed before the discovery of *roseum ;* but the number was small and the owners lacked that enthusiasm whuich characterises the owners of our *roseum* seed farms at the present time though the *jari* seed was supplied by the Department free of cost to seed farms while for *roseum* the price charged is more than twice the *bazar* rate.

5. When in 1912 the number of *roseum* seed farms had increased to 120 for my circle alone, it became evident that our system of propagation and distribution was imperfect. It involved too much touring and supervision on the part of our agricultural staff owing to the farms being scattered.

It would have been difficult, too, to have supplied them with selected seed every year from the Government Experimental Farm, had their number been still further increased. To get over these difficulties various proposals were considered. One of these emanating from the Commissioner of Berar was to propagate the selected seed obtained from the Akola Farm on large farms run by an association or society of share-holders in each district. The money was to be raised as share capital and the leading land-owners of the district were to be induced to take shares. This Association was to have its own staff, but the management of the farm was to be supervised by the Department of Agriculture from time to time. The Association was to supply pure *roseum* seed in large quantities direct to cultivators. At the Divisional meeting of the Berar Agricultural Associations held on the Akola Farm in 1912, this scheme was considered by a committee consisting of the Commissioner and Deputy Commissioners of Berar, the Director of Agriculture, the Registrar of Co-operative Credit Societies, some leading land-owners and myself. After fully discussing its merits and demerits, the committee came to the conclusion that the establishment of a Seed Association or Society on the lines suggested by the Commissioner was likely to detract from the number of workers the energy and interest available to push on the dissemination of improved seed by Co-operative methods. The committee were of opinion, moreover, that Co-operative Credit was destined to be the future link between the Agricultural Department and the public, and that full use should be made of co-operation in propagating and distributing selected *roseum* seed in the villages.

6. As a result of this discussion, four Co-operative Agricultural Seed Nurseries were organised by our Department in the cotton tract in 1912 with the assistance of the Registrar of Co-operative Credit Societies. The number has since been largely increased.

In forming a Seed Union an existing seed farm is selected as the Central Farm of that Union. Pure seed is supplied by the Department to this Central Farm and the seed produced is in turn supplied to the other seed farms of the Union designated Branch Farms, and from this in turn it is supplied direct to cultivators. Each Union consisted of ten or more members, each of whom guaranteed to grow only selected *roseum* cotton, and to keep all the seed produced for distribution. The number of villages included in a Union varied from one to ten. The Department supplies pure seed to the Central Farm and sees that only pure seed is handed over to the branch farms ; while the *Kamdar* of the Union sees that the seed of the branch farms is kept pure. This *Kamdar* is the only paid worker employed by the Union. He supervises the sowing of the seed on all the farms, uproots any alien plants that make their appearance, and looks after the ginning of the *kapas*, and the bagging, labelling and distribution of the seed. The only expenditure incurred by the Union as a rule is that of the pay of the *Kamdar*, which seldom exceeds Rs. 180 per month. In order to be able to meet such expenditure the members have a Union fund, which they raise among themselves, each paying from two to four annas per acre of *roseum* cotton grown. In most cases one of the members has a small ginning plant, consisting of a small oil-engine driving two or three gins. On this plant he arranges to gin all the *kapas* of the Union at a fixed rate.

7. For these Unions we claim the following advantages : (1) The areas selected for the Central and Branch Farms forming the group or union are concentrated and easily supervised. (2) They enable us to control our selected *roseum* seed for two years after it leaves the Akola Farm, and to multiply it about twenty times as fast as could be done under our previous seed-farm system. (3) These Co-operative Unions encourage cooperation among the cultivators : and we believe that agricultural development should, in future, be based more and more on co-operative principles, which aim at teaching the cultivator how to help himself.

8. After much discussion in Committee it was decided that the Central Banks should be the organizing and controlling agency for these agricultural seed unions. At present, however, the Directors of these Banks do not feel that they are fully qualified to do so. This work is

therefore being done by our Department. In the near future we hope, however, to be able to hand it over to the Central Banks, so as to be free to devote our whole attention to new lines of work. The Central Banks will have their own trained staff of Union Inspectors working directly under the administrative control of the Banks and under the advice of the Department of Agriculture.

9. There are at present 71 seed farms, 37 unregistered and 12 registered Unions distributing seed. The seed farms vary in size from ten to sixty acres ; while the area under a Union may be anything from a hundred to a thousand acres.

10. In the formation of a Union there are three stages to be considered, namely, the seed farm, the unregistered Union and last of all the registered Union. By starting with the seed farm we come to know the owner of that seed farm and other leading land-holders of that and neighbouring villages, and are in a position in a year or so to say whether a Union can be run successfully in that locality or not. The Union, too,is tested for a year before we get it registered under the Co-operative Credit Act. It is very important that the members composing the Union should be both good cultivators and good co-operators and a good selection can only be made by having them under trial for a time. The rules drawn up for the guidance of co-operative agricultural unions are appended.

11. The members of the Union appoint a chairman to preside at their meetings, and two supervisors from among themselves to supervise the general management of the Union. The members also belong to the Taluq Agricultural Association which holds its meetings under the Presidentship of the Tahsildar who is official head of the Taluq. The leading men of the Taluq Association are members of the District Agricultural Association of which the Deputy Commissioner is President. A Divisional meeting of the District Agricultural Associations is held once a year at which the Commissioner presides and which is attended by all the members of the Taluq and District Associations.

Every body concerned is thus kept in touch with the work of the Department

12. Science assisted by the Co-operative movement is destined, we believe, to work out the salvation of the Indian ryot. At present the industry on which he depends is comparatively undeveloped. The experience of centuries in cotton cultivation had not taught him that he was growing a mixture of varieties, one of which far surpassed the mixture in yield. Without the aid of scientific knowledge a simple fact of that kind would probably never have come to light. It is the duty of the Agricultural Departments to use their scientific knowledge in making this, our chief industry, more profitable for the cultivator : it is the duty of the Co-operative Credit Departments to assist in organizing the ryots themselves into bodies whose duty it will be to get the findings of the Scientific Department incorporated into the general farm practice of the ryot.

Rules for the guidance of the Co-operative Seed Unions.

(1) Each Co-operative Union shall be responsible for the distribution of selected cotton seed and of improved agricultural implements in a definite circle of villages.

(2) In this circle there shall be established a Central Seed Farm which will so long as is considered necessary by the Deputy Director of Agriculture be supplied each year with selected strains of seed from the Akola Farm. Branch seed farms shall be supplied with seed produced on the Central Farm. The area under the Central and Branch Seed Farms should be large enough to produce seed for the total area under cotton in the circle of villages represented by the Union.

(3) Each member of the Union who is a cotton-grower shall be obliged to sow his whole area under cotton with the pure cotton seed produced on the Central Farm. These areas will constitute the branch seed farms of the Union.

(4) For each Union there shall be appointed one or more *Kamdars*, with the approval of the Deputy Director of Agriculture. They shall be paid by the Union from such funds as the Union may from time to time allot : and the Union shall be bound by the advice of the Deputy Director of Agriculture as to their selection, appointment, control and dismissal.

(5) The fields for the Central Seed Farm shall be the property of one or more of the members, and shall be selected by the Deputy Director of Agriculture or his staff and pointed out to the *Kamdar* in charge who will see that the seed is sown in due season and that alien plants are removed at the time of flowering, both from the Central and Branch Seed Farms. The owner or owners of the Central Seed Farm shall be bound to sell the seed produced on their farm to the Committee at a price fixed by the Deputy Director of Agriculture. The *Kamdar* will work under the supervision and control of the Deputy Director of Agriculture and his staff : his work will be regularly supervised and reported on by the District Agricultural Assistant.

(6) To prevent the intermixture of impure with pure seed in the field, the same areas will be selected every year for the Central Seed Farm ; where this is not practicable *juar* or some other crop shall be rotated with the cotton of this Central Seed Farm.

(7) Any Branch or Central seed farm which, in the opinion of the Deputy Director of Agriculture, is inefficiently managed, may be removed by him from the list of Branch and Central Seed Farms ; and he may thereon call on the Committee to propose fresh ones for his selection.

(8) The *kapas* of the Central and Branch Seed Farms shall be ginned and stored separately and under such condition as will prevent any chance of the seed being mixed with other types.

(9) At the time of distribution the Union shall inform each purchaser what the vitality of the seed is as previously tested and certified by the Deputy Director of Agriculture.

(10) A sample of the seed produced on one of the branch farms of each Union shall be tested at the Akola Farm and their relative degrees of impurity and vitality shall form the subject of a report to be read at the Divisional Meeting of the Berar Associations held on the Farm. Prizes shall be offered for the purest samples sent in by Unions—the money for these prizes being contributed by the Unions themselves.

(11) The price to be charged for the seed distributed shall be decided by the Committee: but the net profit charged on the sale of the agricultural implements should not exceed 12 per cent.

APPENDIX C.

Proceedings of a meeting held on the 28th November 1913 to discuss various questions affecting the jute trade.

PRESENT:

THE HON'BLE MR. P. C. LYON, C.S.I.
MR. A. R. MURRAY, *Chairman, Indian Jute Mills' Association.*
„ A. C. PATTERSON, *Chairman, Calcutta Baled Jute Association.*
„ C. A. GIANNACOPULO, *Chairman, Jute Fabrics Shippers' Association.*
„ C. N. DOUETIL, *Chairman, Baled Jute Shippers' Association.*
„ G. S. E. COLVILLE, *Chairman, Jute Fabric Brokers' Association.*
„ H. M. HAYWOOD, *Secretary, Bengal Chamber of Commerce.*
„ J. H. KERR, C.I.E., *Secretary to the Government of Bengal.*
„ J. R. BLACKWOOD, *Director of Agriculture, Bengal.*

Mr. Murray said that the members of the Jute Forecasts Committee desired to make some remarks on the topics mentioned in their Secretary's letter No. 28-J.F., dated the 22nd November 1913. As regards the importance of agriculture in Bengal, Mr. Murray pointed out that, of the total population of the province, over 75 per cent. are engaged in agriculture, and that the main natural increase in the population had been in the districts where jute is cultivated. Out of 26 million acres of cultivated area in Bengal, 21 millions are under rice and 3 million acres under jute. He estimated that the annual value of the different crops was —rice 102 crores, jute 42 crores, and oilseeds 6½ crores. The net land revenue derived by Government from Bengal appeared to be 2¼ crores, while the expenditure on agriculture in Bengal was less than 2 lakhs. As over 10 million acres are available for cultivation, he wanted to know why emigration to the colonies and to Assam could not be stopped and the province developed by the application to its soil of the labour which now went to the colonies and to other provinces. Mr. Lyon said that he thought that it would be found that only a very small proportion of the Indian emigrants to the colonies came from the Presidency of Bengal as now constituted. Much of the 10 million acres shown as available for cultivation was poor land, which would be entirely unfit for jute and which it would not pay to cultivate. A good deal of it was in the Sundarbans, but the development of this area was proceeding slowly owing mainly to the large amount of capital required.

Mr. Murray then said that perhaps the most important point which the Committee wished to urge upon the consideration of Government was the importance of securing continuity in the post of the Director of Agriculture. There had been seven or eight different Directors of Agriculture in the last eight years. In these circumstances, it was impossible for anybody to work out a good system of crop forecasts. Mr. Lyon agreed in the importance of securing greater continuity in the post of Director of Agriculture, but pointed out that the collection of statistics depended more on the system of obtaining information locally than on arrangements made at head-quarters. Mr. Murray said that the Director should be paid at higher rates and given inducements to stay in his post for a term of years. Mr. Lyon said that it was not merely a question of pay, but the retention of a member of the Civil Service in a special post for a long period of time might be held to lessen his efficiency for work in the general administration. Mr. Murray said that more permanence was required in the department. Experts should be put in with proper trianing and should be treated as permanent officials in charge of the department under the Director. A Director should not be put in without any proper training and without any instructions as to his duties. Mr. Lyon said that eventually the Deputy Directors of Agriculture would develop into the kind of permanent officials suggested by Mr. Murray, but it was only six or seven years since such officers had been appointed. Mr. Murray said that he did not want a commercial man as Director of Agriculture, but a member of the Civil Service who would be permanent in the post. The officer should be sufficiently senior to be able to issue instructions to Collectors on such matters as the jute forecast. He should be an active man and should undertake to hold the post for ten years at the very least. The Committee were quite content to leave it to Government to decide what pay should be given, but they thought that it should be raised to the level of the pay of the head of a major department, and that it should be sufficient to induce a first class man to stay in the department for a considerable period.

The methods of preparing the forecast were then discussed. Mr. Lyon explained that formerly, in the absence of any cadastral survey or local agency, the area under jute was reported by the police, who got their information from the *chaukidars*. There was no statistical basis for a forecast except where a cadastral survey had been made. Mr. Blackwood last year introduced the system of obtaining returns from the *panchayats* as to the area cultivated

with jute by each cultivator within a *panchayati* union. This system was a great improvement over the old system of guess work. Mr. Murray enquired why the system was not introduced before. Mr. Lyon said that the *panchayati* system had only been introduced recently. Mr. Murray said that the question of yield was important as well asthe question of area. Mr. Blackwood then explained his system of forecasting outturn by means of special enquiries as to the outturn per acre in different tracts, and as to the relation borne by these actual outturns to the normal outturn of the area. It would be some time before correct normal outturns could be ascertained under the new system. Mr. Murray said that he hoped that the new system would not be changed without due consideration, and enquired why Assam and Bihar still adhered to an outturn of 3 bales per acre, and why the Assam Director of Agriculture published figures different from those of the district officers, in contravention of the understanding which was come to in 1910. Mr. Lyon suggested that the Committee should address the Assam Administration on this point, but the question of asking other Governments to bring their system into line with that of Bengal would be considered. Mr. Murray then said that the figures for Nepal and other outlying districts should be included in the forecast. Mr. Blackwood said the Nepal figures could be mentioned, but as they were merely estimates, it would not be advisable to include them in the total forecast of outturn. Mr. Murray said they wanted correct figures about the export of jute from Madras. Mr. Lyon said he would see if this information could be obtained. Mr. Murray also suggested that as the statistics of area were now based on returns dealing with individual cultivators, the total number of persons cultivating jute in Bengal might be made public.

Mr. Murray then raised the question of making the weekly weather and crop reports bear some relation to the estimates of crop and yield in final forecasts. He said that this year the area under the *deshi* crop was reduced from 462,000 acres in the preliminary forecast to 181,000 acres in the final forecast, without any warning having been given in the weekly crop reports. The terms used in the weekly crop reports should also be better defined and, if possible, standardised. One Collector reported in his weekly crop report that prospects were not good, but the outturn of that district in the forecast was 90 per cent. of the nornal. Mr. Lyon said that it would be difficult to give any detailed information in the weekly crop reports, but that the question of standardising the terms in use would be considered.

Mr. Murray next said that much greater attention should be paid to trade statistics. In the last final forecast, Mr. Blackwood had shown the outturn figure as 102·4 lakhs of bales, but the basis on which it was calculated was not explained. The Director-General of Commercial Intelligence's figures were also very bad. Apparently he had corrected the actual outturn figures up to 1904 only, and from 1905 onwards he had taken the forecast figures, which were notoriously incorrect. The Director of Agriculture should, in his annual reports, give actual statistics showing whether his forecast had turned out correct or not. More care should be taken with figures in Government publications generally. In the General Administration Report for Bengal for 1911-12, it was stated that wheat covered 1½ million acres, whereas the correct figure was 150,000 acres. The Season and Crop Report shows astonishing variations of prices in neighbouring districts, and the figures could not have been properly checked. He thought that the figures of the export of jute from particular areas should be compiled on the lines of the statistics now compiled by the trade. The jute-growing area might be divided into natural blocks. The export statistics would show how much jute actually came out of each block, and this amount divided by the acreage would be a valuable check on the figures of outturn per acre adopted for that block. Mr. Lyon said that it would be difficult to be certain as to the district or block of origin. At Goalundo, for instance, it would be impossible to say whether jute had come from Northern Bengal or from Dacca or Mymensingh. A lot of Purnea jute also comes through Sara. The matter would, however, be further considered.

As to the improvement of jute cultivation, Mr. Murray said that the chief action required was to improve the seed and to have numerous demonstration plots such as those in the Central Provinces for cotton. Mr. Lyon said it was hoped ultimately to have a demonstrator in each *thana*. Mr. Murray said that the report showed that in previous years the Agricultural Department had apparently done something in the way of providing seed for the cultivators, but he could find nothing on this subject in the reports for the last two years.

Mr. Lyon said that Mr. Murray's remarks constituted a powerful and serious indictment of the Agricultural Department. He must admit that due attention had not been paid to agriculture in the past, but a great deal had been done since Lord Curzon took up the question about eight or nine years ago, and the point for practical consideration was what Government could do for jute in the future. At the same time, it must be understood the Government's resources were limited. He asked whether the jute industry would be prepared to assist financially in improving the jute forecast and jute cultivation generally, as the tea and indigo industries had done. Mr. Murray said that the case of tea was different, as there were still many scientific problems in connection with it to be solved, but as regards jute, it was already known what the best kinds were. Mr. Lyon said that he thought this was an overstatement. Mr. Finlow had classified the best races of jute, but the Agricultural Department was not yet in a position to say that any particular variety could be grown successfully

in any area in which it was not grown at present. Many more stations for experiment were necessary before the department could confidently tell the cultivator that it could supply him with seed, which would give better results than the seed he was at present using. As regards the extension of jute cultivation, he had carefully read the correspondence on the subject and must say that he had come to the conclusion that Government could take no direct action in the matter. Mr. Murray said that the province grew more rice than it required for its own consumption, and a large quantity was exported. Steps should be taken to extend the area under jute, as it was most profitable to the cultivators, or at least, it might be grown on the same land in the same year in rotation with rice or potatoes. The demonstrators should try and introduce jute in areas where it was not now grown. This year the Agricultural Department should satisfy itself that the *deshi* districts had enough seed for their requirements, and, if necessary, procure seed to supply any shortage that might exist. Mr. Lyon said that this question was already under enquiry, but that as a rule the cultivators showed themselves quite capable of procuring all the seed which was required, and better results were obtained by leaving them to procure their own seed than by Government intervention. Mr. Douetil said that the danger of the present high prices of jute was that artificial substitutes would be introduced. It was for this reason that the trade were anxious to secure an extension of the area under jute. Even if prices were reduced by half, jute would still be more profitable to the cultivators than other crops. He thought that the Jute Mills' Association might take up a large area in the Sundarbans for the cultivation of coarse jute which met their requirements, thus setting free the finer qualities for export. Mr. Lyon said he fully sympathized with the apprehension of the trade regarding the introduction of artificial substitutes, but he was still unable to see any practical method in which Government could secure an extension of the area under jute, even if the trade agreed to contribute towards any expenditure which Government might incur in this connection. Mr. Murray said that the shortage of seed was a real difficulty, because it paid a cultivator better to sell his jute for fibre than to keep it for the sale of the seed. Arrangements should be made to distribute good seed through Government agency.

Mr. Lyon then enquired what would be the probable attitude of the trade towards a proposal that they should contribute to the improvement of jute forecasts and jute statistics generally. Messrs. Patterson and Douetil said that they thought the trade would contribute if Government would help. Mr. Patterson said that the trade should certainly contribute towards any scheme for providing a cheap supply of good jute seed. Mr. Lyon said that the present intention was ultimately to have a trained demonstrator in each *thana* in order to assist the cultivators in introducing improvements in cultivation generally. He thought that it was essential that these demonstrators should themselves belong to the cultivating class, and they must be thoroughly trained before they could do any good. Mr. Murray said that this would take years, and that the trade wanted a start made at once. Why should they not appoint 300 or 400 cultivators as demonstrators and set them to work at once? The incompetents could be weeded out gradually. They should go to the areas where the outturn of jute was highest, and then teach other people how to improve their methods. Mr. Lyon said that some untrained demonstrators were employed this year, but that they had been withdrawn as being unlikely to do any good. The scheme would however be accelerated as much as possible. He did not think that the demonstrators would be of much assistance in regard to the forecasts. The demonstrators must be of the cultivating class, and a different class of men was required for the forecasts. A suggestion had been made that a thoroughly good practical man should be appointed in each division, who would deal with the *panchayats'* work in connection with the preparation of the forecast. A staff would also be required in every district and in every sub-division, and perhaps in smaller areas, to check the *panchayats'* work, and they could also take up the question of improving trade statistics. In fact a regular Statistical Department would be wanted. Mr. Murray said that this would be a good scheme, but the trade wanted it to start at once. He urged that each divisional statistical officer should be changed every three years, or else he might be got at. Mr. Lyon said that continuous experience would be very valuable to an officer checking the local returns. The same argument applied to this as to continuity in the post of the Director of Agriculture.

As regards the Director of Agriculture, Mr. Lyon saw great practical difficulties about keeping on a good man for a long term of years, and asking him to give up all his prospects in other branches of the service. Mr. Murray said that a good man with a good staff would raise the department to a position of such importance that he would have to be admitted to a seat in the Executive Council. Mr. Patterson said that the post should be sufficiently attractive in itself to induce a good man to stay in it, and Mr. Giannacopulo thought that no Director of Agriculture could undertake any large changes or improvements unless he was certain of a long tenure of his post. Mr. Lyon said that these views would be carefully considered.

Mr. Lyon said that he thought Government would be justified in asking the trade to contribute to any expensive scheme for improving the forecasts and statistics connected with the jute trade, as such a sheme would be useful mainly for trade purposes. The members

of the Committee thought that the trade would be willing to consider the question of contribution favourably, when a scheme was drawn up and placed before them. It was agreed that a scheme should be drawn up as early as possible and sent to the Committee for consideration. Mr. Murray said that it would save a great deal of time and correspondence if the Committee were allowed to meet Mr. Lyon, when a scheme was ready, and discuss it with him personally, and Mr. Lyon expressed his complete concurrence in this view.

DEPARTMENT OF AGRICULTURE.

Notes by Chairman of Indian Jute Mills' Association.

I. To impress upon Government the importance of Agriculture in Bengal.

The Presidency of Bengal has an area of 84,092 square miles.

The total population according to 1911 Census is 46,305,642.

Though somewhat smaller than Great Britain, Bengal contains nearly a million more inhabitants than the whole of the British Isles.

With an average density of 551 persons to the square mile, Bengal is far more thickly populated than any European country except Belgium.

The density per square mile of other countries and provinces is as follows :—

England, Wales and Scotland	460	Persons per square mile.	
Germany	311	,,	,,
France	189	,,	,,
Madras	291	,,	,,
Bombay	145	,,	,,

In some districts such as Dacca with fertile soil suited to the cultivation of both rice and jute, the density of population is very high, there being over 1,100 persons to the square mile in Nariangunge Sub-division and from 1,600 to 1,996 in *thanas* in the Munshigunge Sub-division. In the Madaripore Subdivision of Faridpur, another Jute district, the density also rises to over 1,000.

It cannot be said that the depopulation of the rural tracts is yet a serious problem in Bengal, for 936 persons out of every 1,000 live in the country.

During the 39 years over which the census operations have extended (1872—1911), the population of Bengal has increased from 34¾ to 46¼ millions, equal to 33½ per cent.

During the last decade (1901—1911), the actual increase in Bengal has been 3½ millions or 8 per cent.

The increase of population is due partly to immigration from other provinces to the cities and industrial towns of West and Central Bengal and the tea gardens of Northern Bengal and partly to natural growth in the fertile rice and jute growing areas of East Bengal. For instance, the percentages of increase of population in relation to density during the last decade in the principal jute-growing districts in Bengal are as follows :—

	Area under jute in acres	Percentage of increase in population, 1901—1911
Mymensingh	558,602	15·5
Dacca	270,000	11·9
Rungpur	275,000	10·7
Faridpur	219,200	8·7
Tippera	277,925	14·7

These districts contain almost 60 per cent. of the total area under jute in Bengal and it is remarkable that they should show an overhead increase of nearly 13 per cent. while the average of the whole province, including cities and towns, is only 8 per cent.

To East Bengal the remarks in the Bengal Census Report for 1872 are still specially applicable :—

> " In a country like Bengal, where a large proportion of the land yields two crops a year, where the diet of the people consists almost entirely of rice, where there are no preventive checks to the increase of the population and where the only positive check is disease, we must expect to find a population far in excess of what we are accustomed to meet with in the West. An Indian population, indeed, would seem to be limited only by the extent of cultivable land in each district."

In Bengal 35½ millions or three quarters of the population are supported by pasture and agriculture, as follows :—

30 millions are ordinary cultivators.
1¼ ,, get an income from agricultural land.
3½ ,, are farm servants and field labourers.
¾ ,, are engaged on plantations and raising animals.

35½ millions.

About a million earn a livelihood from fishing—

⅔rds being engaged in fishing operations, and

⅓rd being maintained by the sale of fish.

About three quarters of a million are engaged in transport by road and river.

			Acres.
The total area of Bengal is			50,345,880
Not available for cultivation			14,276,513
			36,069,367
Culturable waste other than fallow		5,201,098	
Current fallows		4,913,369	
			10,114,467
Net area cropped in Bengal in 1912-13			25,954,900
Area cropped more than once			4,543,400
			30,498,300
Under—			
1. Food grains—			
Rice		21,166,000	
Others		1,894,600	
		23,060,600	
2. Oil Seeds and Spices		1,966,100	
3. Sugar Crops		271,100	
4. Fibres—			
Jute	2,927,100		
Others	84,700		
		3,011,800	
5. Drugs and Narcotics		467,000	
6. Fodder Crops		115,800	
7. Orchards and Garden produce		826,300	
8. Miscellaneous—			
Food		450,500	
Non-food		329,100	
			30,498,300

Of persons supported by pasture and agriculture there is one actual worker for every two dependants. The total area under crop and fallow is acres 30,868,269. The actual workers number about 11½ millions. 30,868,269 ÷ 11,500,000 gives 2·6 acres per actual worker which is about the area (2·5 acres) of a subsistence holding, *i.e.*, a holding from the produce of which an agricultural family can manage to subsist in *normal* years.

Rice is the principal crop and the chief article of human food in Bengal. As above noted the gross area of the Presidency is about 50 million acres, of which almost 26 millions are cropped.

Rice with 21 million acres covers about 42 per cent. of the gross area and over 80 per cent. of the actual cropped area.

Jute ranks next in both area and value. While the area under jute in the Bengal Crop Report for 1912-13 is shown as above to be 2,927,100 acres, the Director of Agriculture has since reduced that figure to 2,536,888. The reduced area under Jute therefore is only 5 per cent. of the gross in Bengal and not even 10 per cent. of the actual cropped area.

Oil seeds are amongst the other valuable crops in Bengal.

The following statement shows the estimated area, yield and value of the crops above referred to, according to the Government Forecasts for the season 1912-13.

Crop	Area under cultivation	Maunds per acre	Percentage of yield	Yield in maunds	Average price, say	Value	Income per acre
	Acres.				Rs. A. P.	Rs.	Rs.
Rice—							
Aus (Autumn) .	4,993,600	10	87	43,444,320			
Aman (winter) .	15,313,900	12	98	180,091,464			
Boro (summer) .	314,700	13½	90	3,823,605			
"	20,622,200			227,359,389	4 8 0	1,02,31,17,250	49
Jute (as amended) .	2,536,888	17 *circa*	97	42,283,388	10 0 0	42,28,33,880	166
Oil Seeds—							
Linseed . .	199,800	6	90	1,078,920			
Rape and Mustard .	1,325,400	6	90	7,157,160			
Til . . .	251,200	5·4	86	1,071,818			
	1,776,400			9,307,898	7 0 0	6,51,55,286	36
						151,11,06,416	

These three crops alone yield an income of over £100,000,000 sterling in the province of Bengal.

II. To press for recognition of the Department of Agriculture as the most important in the Province.

Out of a total area in Bengal of 50 millions, 31 millions are under crop and fallow = 62 per cent.

Out of the total area of 36 millions available for cultivation, 31 millions are under crop and fallow = 86 per cent. : leaving only 5 million acres culturable waste = 14 per cent.

For the year 1911-12 the total Land Revenue was as follows :—

	Imperial	Provincial	Total
	Rs.	Rs.	Rs.
Land Revenue	1,14,43,000	1,57,27,000	2,71,70,000
Less—Expenditure	16,99,000	35,09,000	52,08,000
Net .	97,44,000	1,22,18,000	2,19,62,000

The amount spent on the Agricultural Department is not made public, being buried under the head of " Scientific and other Minor Departments," but it is understood not to exceed Rs. 2,00,000.

In the year ended 30th June 1910, the following items of expenditure were incurred on miscellaneous experiments and enquiries *other than those carried out in agricultural stations* :—

		Rs.
Central Seed Store		14,206
Contributions to—		
Bihar Indigo Planters	32,500	
Tea Association	3,500	
Flax experts	2,750	
		38,750
Agricultural Associations		16,889
Agricultural Literature		3,596
Expert Staff –Travelling Inspectors		2,600
Miscellaneous—		
Sericulture	47,288	
Other items	13,530	
		1,36,859

This was all the money spent in Bengal when it included Bihar and Orissa where most of the expenditure was incurred. Since then the Department has been ashamed to publish any accounts.

But from the Report of the Agricultural Department for the year ending 30th June 1912, it appears the following charges were incurred at Agricultural Stations, *viz.*:—

	Acres.	Rs.	
Dacca	353	28,813	
Chinsurah	210	4,031	
Rungpur	52	5,613	Tobacoo only.
Rajshahi	63	4,245	
Rangpur	20	1,381	
	698	44,083	

Burdwan . . . . . Rs. 2,128 supported by the Maharaja of Burdwan.

It is quite evident Government take little interest in agriculture and expect the public to take less, as last year orders were issued to the Director of Agriculture, Bengal, for the curtailment of his Annual Agriculture Report.

III. To request that the scope of the Department of Agriculture be widened and the Establishment increased.

While it is said there are over 10 million acres in Bengal not available for cultivation and over 4 million acres under Forests which it may or may not be possible to clear, there is still a lot of land available for cultivation over and above that now under crop, *viz.*:—

	Acres.
Culturable waste other than fallow	5,201,098
Current fallows	4,913,369
	10,114,467

Yet inhabitants of Bengal are allowed to emigrate not only to other provinces in India but also to the Colonies and other Countries. At the time of last census (1911) emigrants entered as born in Bengal were enumerated in :—

Mauritius	19,691
Straits Settlements	3,300
Malay States	3,059
Fiji	2,641
Ceylon	1,561
Natal	442

There were also in Natal 15,026 emigrants from Bihar and Orissa.

Musalman cultivators are steadily moving from Dacca, Mymensingh Pabna and Rungpur in quest of land along the fertile *churs* in Goalpara, Assam, where there are now over 70,000 emigrants from these four districts, 50,000 of whom migrated during the past 10 years.

135,756 emigrants from Bengal were also enumerated in Burmah at last census, cutting rice crops in Burmah instead of cultivating land in Bengal.

Can work not be found at home for these emigrants ?

Why send 20,000 persons from Bengal to Mauritius to cultivate sugar for shipment to India ? Last year Calcutta alone received from Mauritius 302,106 cwts. of refined sugar valued at Rs. 32,74,000 and other 89,612 cwt. of molasses and imported altogether from all sources 350,000 tons of sugar to the value of Rs. 5,67,45,000.

During the year 1911, 12,716 emigrants were registered at Calcutta, of whom 2,242 went to Trinidad, 2,233 to Fiji and 2,120 to Demarara—all to grow sugar, which they could just as well do at home. Figures published by the Commercial Intelligence Department show that, in 1898-99 there were 861,100 acres under sugar-cane in Bengal, including Bihar and Orissa, while in 1912-13 there were only 488,000. It seems uneconomic to permit emigration agencies in Calcutta when Bengal cannot get labour sufficient to cultivate its own land far less to extend its industries.

All the large manufactures have to depend on other provinces for their labour supply. In the 24-Parganas alone the foreign born population increased by 176,000 during the past decade and now amounts to 402,000 or 16½ per cent. of the total population—

Bengali is the language of 92 per cent. of the population;

Hindi and Urdu is the language of 4 per cent. of the population;

but to show how Jute Mills have to attract and import labour from other provinces, in a typical Jute Mill area like Titaghur with (in 1911) over 45,000 inhabitants—75 per cent. speak Hindi, 8 per cent. Telugu and 4 per cent. Oriya while 11 per cent. only speak Bengali.

In Bengal a 10 years scheme for the development of the Department of Agriculture was submitted in February 1906. It would be interesting to know to what extent same has been given effect to, as there is reason to believe the present officials have never heard of it.

Proposals for the creation of provincial and subordinate Agricultural services for Bengal were prepared in 1906-07 and submitted to the Government of India. In 1908 they were still under the consideration of the Government of India, but in 1909 they were returned to the Government of Bengal for reconsideration, and nothing more has since been heard of them.

Since the Sabour College went over to the province of Bihar and Orissa, there is not an Agricultural College of any sort in Bengal. It is doubtful even if the Sabour College is doing much good. It had only 21 students in 1911, all of whom were Hindus, although there are far more Muhammadans than Hindus engaged in Agriculture.

Of the total population in the province—

52 per cent. are Muhammadans, of whom 85 per cent. are engaged in Agriculture.

45 per cent. are Hindus of whom 63 per cent. only are engaged in Agriculture.

The great majority of the Muhammadans have not yet got beyond the stage of the cultivator who tills his own holding.

It is practical and ocular demonstration that is wanted for these cultivators, not theoretical training or even agricultural literature.

In Bengal only 3½ millions or 7·7 per cent. of the population are literate. In Mymensingh, Rajshahi, Rangpur, Malda and Tipperah less than 5 per cent. are literate.

Of Hindus 2½ millions are literate, equal to 12 per cent.

Of Muhammadans 1 million only are literate, equal to 4 per cent.

In the year 1906-7 leaflets were prepared, including—

(1) Note on Jute Experiments at Cuttack.

(2) Note on Jute Experiments at Burdwan.

(3) Jute in rotation with paddy in the same year.

(4) Potatoes in rotation with jute.

These were translated into the three vernaculars, Bengali, Hindi and Oriya and distributed in the districts concerned.

Could these leaflets not be brought up to date and circulated in all districts and contents explained by the same agency as gathers particulars for forecasts ?

There are 363 *thanas* in Bengal and an effort should be made to have an officer or officers of the Agricultural Department in every *thana*, the average area of which is 217 square miles. These officers would be in addition to, and act as a check on, *panchayats*,

IV. To press for the appointment of a Director of Agriculture who will be able to hold the office for a term of years and so ensure continuity of system in the working of the Department.

Since 1901 when the Hon'ble Mr. Lyon held office there have been 9 Directors of Agriculture in Bengal. Since 1904 when Assam published its first Forecast of the Jute Crop, there have been 14 different Directors of Agriculture signing Forecasts in the three provinces. The following comparative statement shows the result of their efforts in forecasting the Jute Crop during the last half a dozen years :—

Area	Year	Director's Estimate			Trade Statistics
Acres.		Bales.			Bales.
38·83 lakhs . . .	1907	97·29 lakhs	including	143,000	87 lakhs.
28·41 „ . . .	1908	64·02 „	„	91,000	88 „
27·33 „ . . .	1909	72·95 „	„	89,000	89 „
		District Officer's.			
29·38 „ . . .	1910	66·98 . . . 79·32			
		added for excess stock . 3	excluding	81,000	
		„ moisture 3·97			
		86·29			80 „
31·06 . . .	1911	82·35	excluding	79,000	96 „
33·54 altered to 29·70 .	1912	95·21			102 „
31·70 . . .	1913	87·52			..

During the half dozen years (1907—12) there were seven different changes in the Directorship of Agriculture in Bengal, *viz.*:—

1907—Mr. Oldham until November 1907, then Mr. Gourlay.

1908—Mr. Gourlay.

1909—Mr. Gourlay.

1910—Mr. Gourlay until February 1910, Mr. Buchan until October 1910, then Mr. Gourlay.

1911—Mr. Gourlay to April 1911, Mr. Heycock.

1912—Mr. Heycock until March 1912, Mr. Hart until May 1912, Mr. Blackwood.

From 1908 there has been a decided tendency to underestimate the crop which the Directors in 1910 tried to correct by drastic measures and which the Director now is endeavouring to avoid by increasing the yield per acre. But it is a sad commentary on the efficiency of the systems of compiling forecasts that an estimated area in 1907 of

38·83 lakh acres should have resulted in a crop of 87 lakh bales

while a revised area in 1912 of

29·70 acres should have given a crop of 102 lakh bales.

V. To suggest that the pay of the post should be so increased as to enable it to be held for a number of years by a Senior Officer.

Why are there so many changes ? Because the Directors only look upon the post as a stepping stone to higher things.

Mr. Allen and Mr. Maddox took up the Chairmanship of the Calcutta Corporation.

Why should the post not carry extra salary, same as—

Chairmanship of Corporation,

Chairmanship of Improvement Trust,

Collector of Customs ?

The post of Director of Agriculture is a difficult one and, so far as forecasts are concerned, a thankless one.

Substantial inducements should be given to Senior Officers to remain at the post for a lengthy term of, say, 10 years.

Given the proper man, with an efficient staff, and he should soon be able to make the Department of such importance as to justify the Director being made a member of the Legislative, if not of the Executive, Council.

VI. To discuss crop forecasts, Jute in particular, and the methods of calculation on which the forecasts are based.

How is the area under any crop ascertained ?

How is the estimate of yield arrived at ?

If crop cutting experiments have anything to do with estimating the yield can the actual figures be published for information ?

During	5 years	1897-98 to 1901-02	there were	3,294 experiments.
,,	5 ,,	1902-03 to 1906-07	,,	4,111 ,,
During the year		1907-08	,,	900 ,,
,,	,,	1908-09	,,	887 ,,
,,	,,	1909-10	,,	850 ,,
,,	,,	1910-11	,,	2,813 ,,

Why has it taken so many years to change the average yield of jute from 3 bales per acre to

3·2 bales in Western Bengal,
3·5 ,, in Northern Bengal,
3·7 ,, in Eastern Bengal ?

Can any calculations be produced in support of this differentiation between different districts ?

Why have the Directors of the other provinces not altered their average yields also ?

Why has the Director of Agriculture for Assam given an estimate different from that of his District Officers after it was agreed this should not be done. In the consolidated forecast for the three provinces the total acreage does not give effect to the Assam Director's revised figures.

Why has prominence not been given to imports from Nepal and other outlying districts, as well as to exports from Madras ?

What about the detailed list of the jute cultivators and the areas sown by each ? Is such a list in existence ?

VII. To consider whether it is not possible for weekly weather and crop reports to bear some relation to the estimates of acreage and yield in final forecasts.

The following is a comparison between the area and yield of the *deshi* crop this year as against last year :—

	Divisions		Total
	Presidency	Burdwan	
I. Estimated area under jute—	Acres	Acres	Acres
Last year	383,300	79,623	462,923
This year	365,974	85,974	451,948
Area from which crop can be expected this year	152,103	29,291	181,394
II. Estimated total yield—	Bales	Bales	Bales
Last year	1,280,240	267,713	1,547,953
This year	299,767	56,416	356,183

The weather and crop reports between the Preliminary and Final Forecasts never gave any real indication that the *deshi* area was to be reduced from 462,923 to 181,394 acres or that the outturn was to be reduced from 1,547,953 to 356,183 bales only.

It is the same with other districts also. Just compare the percentages of estimated yield given in the final Government forecast with the telegraphic reports of crop prospects sent in by the same District Officers at the very time when they were compiling their forecast returns, as follows :—

District Officers' telegraphic reports concerning crop prospects at 1st September 1913	District	Estimated yield as per Final Forecast
		Per cent.
BENGAL—		
Damaged considerably	24-Parganas	57
Not favourable	Nadia	70
Fair	Murshidabad	75
Not favourable (18th August)	Jessore	40
Outturn poor	Khulna	45
Damaged in Kalna (25th August)	Burdwan	60
Very bad at Ghatal	Midnapore	40
Considerable damage	Hooghly	60
Prospects poor	Howrah	80

NOTE.—Above percentages of yield are estimated on a reduced area of altogether 181,394 acres, instead of on the area of 451,948 acres which were originally returned as under jute—a reduction of about 60 per cent. in area before yield calculations begun to.

District Officers' telegraphic reports concerning crop prospects at 1st September 1913	District	Estimated yield as per Final Forecast
		Per cent.
Fair	Rajshahi	80
Not good (25th August)	Dinajpur	86
Fair (25th August)	Jalpaiguri	92
Distinctly below normal	Darjeeling	92
Good	Rungpur	92
Fair	Bogra	91
Normal outturn (18th August)	Pabna	96
Certain quantity damaged (18th August)	Malda	90
Not good	Dacca	90
Fair	Mymensingh	90
Below average	Faridpur	85
Some damage (11th August)	Bakarganj	88
Good	Chittagong	85
Slightly below normal [Fair (25th August)]	Tipperah	100
Good on the whole	Noakhali	85
Fair (25th August)	Cooch Behar	90
BIHAR AND ORISSA—		
Good (11th August)	Champaran	96
Good	Muzaffarpur	70
Favourable	Bhagalpur	70
Fairly satisfactory	Purnea	62
Well	Sonthal Parganas	70
Fair	Cuttack	72
Growth retarded	Balasore	48
ASSAM.—(Remarks by District Officers in Forecast)—		
Damaged	Sylhet	50
Not very favourable—fair	Goalpara	90

From the above it will be seen that the undernoted percentages of yield may be expected from telegrams reading :—

	Per cent.
"Normal"	96.
"Slightly below normal"	100.
"Distinctly below normal"	92.
"Below average"	85.
"Good"	92, 85, 96, 70.
"Good on the whole"	85.
"Favourable"	70.
"Fairly satisfactory"	62.
"Fair"	75, 80, 92, 91, 90, 72.
"Not good"	86, 90.
"Not favourable"	70, 40.
"Poor"	45, 80.
"Considerable damage"	60.
"Damaged considerably"	57.

What a field for "bulls" and "bears"!

Think of the jute merchant or manufacturer in Calcutta, Dundee, London, Hamburg, or America trying to frame a buying or selling policy where prospects differ so much from forecasts and trade statistics differ from both!

VII.—To arrange for more attention being paid by the Department to trade statistics of the different Crops.

There are no trade statistics of any description given by the Department except in the case of Jute, in connection with which a figure in a column in the abstract consolidated forecast gives a total for the preceding year's crop, without indicating how same is arrived at Bihar and Orissa leaves this column blank and Assam inserts what is apparently an underestimate.

Nowadays no statistics are given of imports from outlying districts or of exports.

Refer to the Commercial Intelligence Department's published figures of Area and Yield under Jute which are hopelessly misleading—*See* pages 1 and 33 of Report for 1911-12. The crops from 1897 to 1904 are said to be revised according to statistics of trade and consumption. Below in the same column for the succeeding years, 1905 to 1911, are given the forecast estimates only, although in the last four years these differ from the trade statistics to the extent of 20 per cent, 24 per cent and even 40 per cent. in three of the years and the fourth year is only kept right by dropping out 7 lakh bales added on by the Director of Agriculture.

To show how statistics might be compiled refer to the Collector of Custom's Report of the Maritime Trade of Bengal, though even all its figures cannot be relied on : *See* pages 20 and 33.

Refer also to Director of Agriculture's Season and Crop Report for Bengal (1912-13) which shows that the harvest prices of the different crops (per Appendix VI) are just as inconsistent and as misleading as the Department of Commercial Intelligence's Crop figures.

Incidentally in the Administration Report for Bengal (1911-12) the normal area under wheat in Bengal is "estimated at about 1½ million acres" while the Director of Agriculture's Forecast for the same year dealt with 143,000 acres only.

Is it not possible to collect statistics of exports from particular districts? Statements are already compiled by the Calcutta and Naraingunge Chambers of Commerce which might be further improved on. The principle on which the "Accounts of Trade carried by Rail and River in India" are compiled might be adapted to the purpose in view. Divide the jute-growing area into natural divisions or "blocks." Register the quantities of jute passing between each block by rail or river. Railway and Steamer traffic is easily checked but boat traffic would require to be registered at certain selected River Stations by special clerks. The figures so obtained, properly abstracted and analysed, would do more to verify the estimates of acreage and outturn in the Government Forecasts than years of guessing, crop-cutting experiments or even cadastral surveys.

IX – Generally whether it is not possible to adopt more sustained and systematic measures for the extension and improvement of cultivation, especially of Jute, now that practically the whole of the Jute-growing area has been brought within one province.

What has been done in the way of providing seed?

The Agricultural Department Reports published in 1906, 1907 and 1908 had interesting appendices *re* jute seed experiments.

In 1905, at 4 centres, 12½ acres gave 27¾ maunds seed.
1906, at 4 „ 99½ „ gave 268¼ „
1907, at 2 „ 53 „ gave 230 „

In the Report for 1907 it was said that at a price of Rs. 15 per maund of seed, the Purnea Jute Seed Farm (of 30 acres of which only 21 acres were productive) would be able to pay all expenses itself, which " was highly satisfactory, for it shows that the business of seedsmen, which is so highly remunerative a profession in other countries, may be carried out with advantage in this country, for with proper arrangements the return even at Purnea may be expected to be doubled, and the expenses to be lessened. * * * It is not out of the way to look five years ahead, and see each one of the present jute seed farms with an extended area and designated as a seed farm under Government control."

In the Report for 1908, the Department showed great pride in this work for with only two centres and 53 acres (of which only 45 were cultivated) 230 maunds of good seed were obtained for distribution. Orders were to be booked at Rs. 15 per maund. Arrangements were made " to supply small as well as large quantities and to prevent delay or disappointment purchasers were asked to kindly submit their indents as soon as possible."

In the Report for 1909, however, these two jute seed farms were abandoned, owing to drought and flood,—the very time when accurate observations should have been made.

According to the 1910 Report, similar weather conditions resulted in little or no seed being obtained at Chinsura.

The Reports for 1911 and 1912 are silent as to jute seed farms.

An acre of land may yield as much as 6 maunds of seed. Seed is sown at the rate of 8 to 10 lbs. per acre. An acre should yield 15 to 25 maunds of jute fibre according to the nature of the land.

Therefore every acre under seed may result in a yield of over 1,000 maunds of jute fibre. Surely a strong inducement to encourage seed farms, as every 100 acres under seed may mean a lakh of maunds extra jute grown.

Jute can be grown in rotation with paddy or potatoes in the same year, the land thus yielding two crops in one year.

Why not have one or more demonstration plots in each District ? It would mean only 22 or 23 centres where agricultural implements, manures and seeds could be kept under Inspectors who could also encourage neighbouring cultivators to make experiments in their own holdings.

In the Central Provinces a large number of demonstration areas are now worked by private owners who allow them to be used for that purpose.

In every district in Bombay there is a trained and qualified fieldman, who carries on demonstrations in the cultivators' own lands.

Small fields in the hands of the cultivators are found to be the most suitable for demonstration work in the United Provinces.

Everywhere, except in Bengal, the tendency to get nearer to the cultivator is evident.

Actual instruction should be given, as far as possible to the children of agriculturalists, demonstration first and then education.

The Punjab Agricultural Department is said to have now ready a quantity of seed sufficient to sow 10,000 acres of American Cotton next Spring.

Cotton cultivation is being improved everywhere in India except Bengal and last year it was stated that in Berar alone there would be 100 Cotton seed farms, covering an area of 4,000 acres and capable of producing 1,000,000 pounds of pure seed per annum.

The Madras Board of Agriculture are increasing the cultivation of the sugar-cane and introducing improved methods of pressing the cane.

In Ceylon the Agricultural Board has obtained the sanction of the Secretary of State to a scheme for providing practical training for the sons of cultivators and they are sending a staff of Agricultural Instructors over to South India to study practical working under the Madras Department of Agriculture.

In the Report just issued of the Rail and River borne trade of Assam, the Director of Agriculture points to the falling off in imports into that province as a sign of local progress. In the case of rice the decrease indicates that Assam is becoming more self-supporting. Exports of mustard seed show a large decline and a steady annual decrease in the importation of mustard oil indicates that more seed is being crushed in the local mills. Referring to increased imports of sugar, the Director remarks that there is no reason why Assam should not grow all its own requirements and sufficient to export as well.

The President of the Board of Agriculture addressing a meeting in England this month said one of the real dangers in farming was the all round shortage of agricultural labour. It

was desirable that the labourer should have stages open to him by which he could go upward, finally becoming his own master. To this end Government were going to make a start by erecting 10,000 cottages and to finance the scheme with £1,500,000 or Rs. 2,25,00,000. The whole scheme was to be worked under central control, and the Government had already called in the best minds of England to assist them in this work.

What is being done in Bengal ?

As pointed out above, the area under sugar-cane cultivation is decreasing while the imports of sugar are increasing enormously. Not many years ago Bengal used to export sugar largely to European countries. In the year 1881-1882, the exports from Calcutta amounted to 218,180 maunds, while in the year 1909-1910 they amounted to 352 maunds only. On the other hand in the year 1881-1882, imports of sugar into Calcutta amounted to 66,431 maunds only while in the year 1910-11 they amounted to 10,385,687 maunds.

Note the decline in the silk trade of Bengal. In the year 1867-1868, the export trade in raw silk alone amounted to 2,138,668 lb. valued at Rs. 1,46,09,140. In 1902-1903 the exports amounted to 1,352,343 lb. valued at Rs. 51,98,936. In 1912-1913 the exports dropped to lbs. 608,307 valued at Rs. 11,82,000. It is sad to remember that in the days of the East India Company and for many years subsequently, silk occupied the first place in the export trade.

Jute, raw and manufactured, now occupies the first place in the export trade of Bengal. During the past year, 1912-1913, it represented over 50 per cent. of the Foreign Export Trade of Calcutta, as follows :—

	Rs.
Jute raw	24,46,99,531
,, manufactured	22,76,62,513
	47,23,62,044
to which must be added—	
(1) Jute raw, exported from Chittagong	2,48,18,000
(2) Jute, Manufactured, exported to Indian Coast ports . . .	2,74,00,000
(3) Exports by rail and river, Tons 99,500 valued at, say . .	3,98,00,000
TOTAL .	56,43,80,044

This year the value of the jute trade to Bengal will be still greater and surely it is not too much to ask that Government should take a more active interest in the cultivation and extension of a crop which directly or indirectly brings into the province from 50 to 60 crores of rupees annually.

It would be nothing short of a national disaster if India and Bengal in particular were to lose the jute trade.

The decline in the Bengal silk trade is said to have been due to the prevalence of silkworm epidemics or to some other causes outside Government control. There is little risk of insect pests being made the excuse for any decline in the jute trade and so long as jute provides the cheapest material for packing and wrapping purposes there is little likelihood of any interference with India's monopoly of the trade in this raw material. But if prices of jute, both raw and manufactured, are to remain at present high levels no efforts will be spared to provide substitutes or to discover other means of handling the produce of the world.

Already elevators, wagons and steam vessels are being constructed all over the world for the handling of grain in bulk. The crops in Canada are nearly all brought to market by this means. On the west coast of North America efforts are being made to introduce the same system. In Australia Government sanction has been given to the expenditure of large sums of money for the like purpose and even in India elevators are being erected for the storage of wheat.

It is bad enough to find outlets for jute manufactures being closed in this fashion but worse still is the knowledge that substitutes for raw jute are actually being discovered. The following extract from the Dundee Trade Report dated 3rd September 1913 explains the position :—

> *Textilose* versus *jute*.—It would appear as if Textilose were making progress in the different countries. It is stated to us that the price of paper yarn is little more than one-half of the price of jute yarn at present high prices.
>
> The Textilose business is in the hands of a French Syndicate. We are informed that a new Association is being founded with a capital of 23,000,000 francs to establish the production of Textilose in different countries. Apparently the right to manufacture is sold for a sum of ready money, and in some cases an interest is acquired in the different undertakings by the ruling syndicate, while royalties are also paid according to production or the guaranteed quantity.
>
> Textilose yarn is a mixture of paper and cotton waste, which is believed to be infinitely superior to all paper yarn. Fabrics made of Textilose warp and Jute weft are also greatly superior to the fabric manufactured from purely Textilose yarn. This industry is in its infancy, whatever may become of it.

France.—At Rethel there is a small factory of 80 looms, capable, however, of considerable development but there is great scarcity of workers. Production seems to be easily disposed of.

The Jute Mills have offered a sum of money in order that they shall not be competed with.

Germany.—There are two mills exclusively for Textilose and one under construction. There is a mill at Adorf and another at Oppeln, and a third going up in west Germany. They have not come to an agreement with the Jute Mills in Germany.

Austria.—At Fleissen a mill was put down, which was bought up by the Jute Syndicate. The Austrian Jute Syndicate have undertaken the production of Textilose, and have bound themselves to produce a large quantity per annum. There is an Association in Austria and also in Hungary, each with a capital of 5,000,000 Austrian kronen.

Italy.—The rights have been acquired by that country, in which venture the Syndicate also has an interest.

Spain.—There also is a company. They are setting up a mill to make paper yarn for themselves.

Brazil.—Textilose has also been taken up in Brazil and the patent right purchased.

North America.—A company has been formed and the necessary arrangements concluded with the Syndicate.

England.—Textilose is also of course in operation in England. There is a Company in Manchester.

India already has had a costly experience of the result of cheap and efficient substitutes being found for the natural article. Less than 20 years ago India had 1,688,042 acres under indigo producing 237,494 cwt. Now only 214,500 acres are under cultivation producing 37,600 cwts. only.

Can the Government of India and the Government of Bengal afford to look on idly and watch jute follow indigo ?

Scarcity of milling plant and absence of local demand for manufacturing purposes may be sufficient reasons for Government not giving more encouragement to the cultivation of sugarcane. The prevalence of silkworm epidemics may be the cause of the steady decline in the silk industry. The introduction of cheap aniline dyes is no doubt the explanation of the decayed condition of the Indigo trade. But so far as can be ascertained there is no excuse for the " laissez faire " policy adopted by Government to agriculture in general and jute in particular. There are already mills in Bengal consuming more than half the total crop of jute. Capital, machinery and labour are and will be forthcoming to consume all the raw material that Bengal can supply. Last year jute mill machinery to the value of Rs. 86,36,021 was imported from Britain into Calcutta for new mills and extensions of existing premises, and imports for the current year are also very heavy, as more new mills and extensions are still under construction. Surely it is up to the Government of India and to the Government of Bengal to spare no efforts for the encouragement of jute cultivation.

The reason sometimes given for Government's studied neglect of jute is that any material increase in its cultivation in Bengal must be at the expense of rice, which is the principal crop and chief article of human food in the province. Apart altogether from the facts that jute can be grown in rotation with rice on the same land in the same year, and that there are millions of acres in Bengal not yet brought under cultivation, there is no ground for the statement that any further extension of jute cultivation will imperil the food supply of the people of Bengal. According to the Annual Statement of the sea-borne trade of this Presidency for the year 1912-13, the Exports and Imports of rice were as follows :—

——	Exports		Imports		Excess of Exports over Imports	
	cwt.	Rs.	cwt.	Rs.	cwt.	Rs.
FOREIGN COUNTRIES—						
Rice in the husk .	261,840	9,62,814	1	6	261,839	9,62,808
„ not in the husk.	9,635,374	6,77,19,543	693	4,617	9,634,681	6,77,14,926
INDIAN PORTS—						
Rice in the husk .	2,730,900	1,16,80,771	40,963	1,10,759	2,689,937	1,15,70,012
„ not in the husk .	1,977,539	1,31,90,698	571,036	28,26,994	1,406,503	1,03,63,704
TOTAL .	14,605,653	9,35,53,826	612,693	29,42,376	13,992,960	9,06,11,450

These are the figures of the sea-borne trade only, and do not include the rail and river trade between Bengal and other provinces in India.

It is to be noted that last year 9,634,681 cwt. of cleaned rice were exported from Bengal to foreign countries. The average yield of cleaned rice per acre is estimated at 12 mds. in the case of winter rice which is the principal crop in Bengal. This is equal to 8·8 cwts. of rice per acre.

cwts.		cwts.		acres.
9,634,681	÷	8·8	=	1,094,851

Without dealing with exports from Bengal to other parts of India, including Burma, by rail, river or sea, there is the produce of over a million acres of land exported to foreign countries in the form of rice. The total area under jute in Bengal this year is estimated at only $2\frac{3}{4}$ million acres. Another million acres under jute would add 3 million bales to the crop.

CALCUTTA,
28th November, 1913.

CALCUTTA: PRINTED BY SUPDT. GOVT. PRINTING, INDIA, 8, HASTINGS STREET.

Agricultural Conferences.

Proceedings of the Inter-Provincial Jute Conference held in Calcutta in August 1915.

GOVERNMENT OF BOMBAY.

REVENUE DEPARTMENT.

Order No. 1146.

Bombay Castle, 31st January 1916.

Circular letter from the Government of India, Department of Revenue and Agriculture, No. 28—115-14 dated 18th December 1915 :—

> "I am directed to forward, for the information of the Governor in Council, a copy of the proceedings of the Inter-Provincial Jute Conference held at Calcutta from the 2nd to the 4th August 1915, and to invite attention to Resolution V passed by the Conference.
>
> "2. The Government of India consider the recommendation of the Conference regarding the desirability of experiments being carried out in the growth of substitutes for jute both in jute tracts and in tracts where such substitutes are not at present cultivated, an important one, and would commend it to the favourable notice of local Governments and Administrations. I am in this connection to invite attention to the note on jute by Mr. R. S. Finlow, which forms Appendix A to the proceedings."

ORDER.—Copies of the letter from the Government of India and of the report of the Inter-Provincial Jute Conference should be forwarded to the Director of Agriculture for information.

J. A. POPE,
Under Secretary to Government.

To

The Director of Agriculture (with copies of the Report).

A Rev 166

No. of 1916.

Copy forwarded for information and guidance to

REPORT

OF AN

INVESTIGATION IN REGARD TO THE PREVALENCE

OF

"STEGOMYIA" AND OTHER MOSQUITOES IN KARACHI,

AND THE

MEASURES NECESSARY FOR THEIR CONTROL.

BY

DR. K. S. MHASKAR, M.D., M.A., B.Sc. (Bombay),
D.P.H., D.T.M. & H. (Cant.),
Officer on Special Duty.

1913.

BOMBAY
PRINTED AT THE GOVERNMENT CENTRAL PRESS
1913

No. 26 of 1913.

From

DR. K. S. MHASKAR, M.A., B.Sc., M.D., D.P.H.,
D. T. M. & H.,
Special Officer in charge of Stegomyia Survey, Karáchi;

To

THE SURGEON-GENERAL WITH THE GOVERNMENT
OF BOMBAY,
Bombay.

Through The Principal Medical Officer, Sind District, Karáchi.

Civil Hospital, Karáchi, 20th February 1913.

Sir,

In presenting this report on "Investigation into the prevalence of Stegomyia and other Mosquitoes in the Port of Karáchi and the measures necessary for their control," I wish to express my sincere thanks due to Dr. E. D. Shroff, M.R.C.S., D.P.H., for his kindness in placing his sanitary inspectors at my disposal from time to time, a favour which greatly facilitated the work, and also for the directions and help which have been of the greatest assistance.

The information given in Chapters I and II has been derived from Government Resolutions, Sind Gazetteer, the Municipal administration report and the annual report of the trade of Sind. But most useful of all has been Dr. Bentley's report on Malaria in Bombay on which the outlines of this report were based, as also the information obtained at the Malaria Conference, Madras, November 1912.

I have the honour to be,
Sir,
Your most obedient servant,
K. S. MHASKAR,
M.D., D.P.H.,
Special Officer in charge Stegomyia Survey.

Letter No. 1762, dated 18th April 1913, from the Director, Bombay Bacteriological Laboratory, Parel, Bombay, to the Personal Assistant to the Surgeon-General with the Government of Bombay.

With reference to your memorandum No. B/4192, dated 26th March 1913, I have the honour to submit the following remarks :—

2. I have read with very great interest Dr. Mhaskar's report on the Stegomyia Survey of Karáchi; in my opinion Dr. Mhaskar has done the work entrusted to him with care and promptness.

3. The first five chapters of the report require no further remarks from me, dealing, as they do, with observed facts, so that I pass on to the 5th chapter which is concerned with preventive measures.

4. Dr. Mhaskar does well in referring in Section I of this chapter to the comparative simplicity of a campaign against mosquitoes in a place like Karáchi when compared with other places in India. He points out that most of the breeding places of mosquitoes in Karáchi are artificial; there are no water-courses, the rainfall is negligible, the soil is sandy and porous, the heat of the sun is great so that pools of water dry quickly. But in contrast to these natural advantages he draws vivid picture of the poverty, ignorance and carelessness of the people. He aptly closes this section by referring to the improvements which have been affected in the water-supply of the town within recent years and the still greater need for further improvement, especially for a more abundant and continuous water-supply, so as to enable the people to dispense with the use of gharras and wells which he had found were the most common breeding places of mosquitoes and which were used and continued to exist only because of the intermittent water-supply.

5. In Section II of this chapter he discusses the measures which are required to prevent multiplication of mosquitoes. These measures aim for the most part at the restriction, removal and protection of collections of water in which mosquito larvae are found. He classes these collections of water into temporary and permanent collections. Under the latter head he deals with wells, cisterns, garden and other tanks, fountains, tubs, etc., and in certain localities marshy ground :—

A.—He proposes in the future to restrict as far as possible these permanent breeding places and he expects to effect this—

(1) by prohibiting the construction of open wells;

(2) by prohibiting the erection of cisterns except in special cases when they must be of approved pattern;

(3) by restricting the use of garden tubs by imposing a license for their use.

B.—With regard to the action which can be taken to remove existing permanent collections of water, Dr. Mhaskar makes the following suggestions :—

(1) *Wells.*—All foul and disused wells should be filled up and those that must be used should be permanently covered with reinforced concrete and a pump attached. If the owner cannot be persuaded or compelled to protect his well in this way he should be made to stock it with fish and keep the well clean.

(2) *Cisterns.*—In many cases these must be reconstructed and fixed in more accessible positions for inspection. In all cases where they must be used they should be properly protected from mosquitoes.

(3) *Garden tanks* should be licensed and subject to periodical inspection and cleaning.

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on 31 October, 2019

C.—Dr. Mhaskar then passes on to consider the temporary breeding places of mosquitoes and he points out that the outstanding difficulty is the insufficient water-supply to every house and the consequent necessity for storing water in receptacles which vary in character according to the means of the inhabitants. To remedy these defects he recommends :—

(1) that an adequate supply of water should be available for every household;

(2) that periodical inspection should be made to ensure that water is not collected and stored in receptacles in such circumstances that mosquito larvae can develop in it;

(3) that the breeding of mosquitoes on any premises should be regarded as an offence subject to penalty;

(4) that a few mosquito breeding places should be selected and established under proper supervision and control to test the efficiency of anti-mosquito measures and to prevent mosquitoes taking to unusual breeding places.

6. In the next chapter Dr. Mhaskar considers the strength and cost of the staff to carry out his very excellent recommendations. He offers three schemes costing approximately one lákh, half a lákh and quarter of a lákh of rupees per annum. He thinks that for an expenditure of nearly a lákh of rupees per annum it would be possible to keep down all mosquitos in Karáchi. For half that sum he thinks it would be possible to control the breeding places of Stegomyia mosquitoes, while the third scheme, costing about quarter of a lákh of rupees per annum, would only allow of the inspection and control of breeding places of mosquitoes which are situated outside of houses.

7. The expenditure proposed for these three schemes is so very different that it is essential to consider which scheme, if any, should be adopted from the point of view of (1) necessity, (2) expediency.

8. Let me first consider the necessity for adopting one or any of the schemes. The present enquiry was undertaken owing to the possible importation of Yellow Fever into Karáchi when the Panama Canal is opened. It is well to point out that Major S. P. James has visited Panama and other places with the object of studying the conditions which may lead to the introduction of Yellow Fever into India when the Panama Canal is opened; his report is at present under the consideration of the Government of India and until this report has been published the necessity for taking precautions other than those which already exist against the possible importation of this disease into Karáchi does not immediately arise. But mosquitoes are responsible for the spread of other diseases than Yellow Fever and Dr. Mhaskar's more expensive scheme aims at the destruction and control of all mosquitoes including the anopheles which spread malaria. The table given on page 15 of the report however shows that fevers account for only one-third as many deaths as are attributed to plague, so that the urgency or necessity of measures against malaria in Karáchi is less than the need for measures to combat the plague.

9. Passing on to consider the expediency for adopting one or any of Dr. Mhaskar's schemes, it is well to point out that the total expenditure on the Health Department amounts to Rs. 73,488 per annum, so that if either of Dr. Mhaskar's larger schemes were adopted, the expenditure on this department would be doubled, a proposal, which, I think, hardly requires consideration especially in view of the remarks I have made above regarding the necessity for the adoption of any measures against Yellow Fever and Malaria when Plague at present causes more than three times as many deaths.

10. I am of opinion that the attention and money of the Karáchi Municipality should be concentrated on effecting improvements in the water-supply, drainage and housing of the inhabitants of the town, that meanwhile measures should be taken to prohibit the construction of new open wells or the erection of cisterns, fountains, etc., disused wells should be filled up and arrangements made to supply pipe water at those places when wells are at present used so that these may be closed.